RAILROAD GAZETTE

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Contributions

Train Load and Train-Mile Cost.

East Toronto, Canada, Sept. 24, 1903.

TO THE EDITOR OF THE RAILROAD GAZETTE:

A member of the Dominion Parliament recently asserted, in the course of a debate in the House, that the cost of working a full train load of grain, on a leading railroad in the United States, is less than a dollar per mile. Other speakers maintained that the cost, for a 60-car train is about two dollars per mile. Will the *Railroad Gazette* kindly inform us if there is any road in the United States now hauling grain in 60-car trains, and if so at what cost per mile, including all charges usually taken into running expenses?

C. BARTHOLOMEW.

[Sixty-car trains are fairly common. The maximum weight (dead and paying load) hauled by the New York Central in ordinary grain practice is from 3,300 to 3,500 tons in a train of upwards of 60 30-ton cars. A train of 80 cars, gross weight 4,500 tons, has been hauled over the line. Cost of working, however, is a figure that cannot be named off-hand. The pro-rating of fixed charges and maintenance, the need of cars at certain times and places, competition and the element of profit or loss on the back haul are matters which might be reckoned quite differently by different estimators. If a rule of thumb is desired it is probably safe to say that the *prime* cost of moving a 60-car train loaded with grain would fall considerably under a dollar a mile; very likely under 65 cents. The term prime cost as it is here used means the cost at which a few extra trains could be run without loss, over a line where ordinary traffic paid for maintenance and fixed charges.—EDITOR.]

Axle Failures in Germany.

The German Railway Union, which comprises in addition to Germany proper, the railroads of Austria-Hungary, Holland and Roumania, publishes each year a detailed statement of the axle failures of the preceding year. An article by M. E. Biard in the *Revue Générale des Chemins de fer* for August gives an extended analysis of the reports of failures for the years 1888 to 1900, from which the following figures are taken.

The actual number of axle failures is so small that tabulations are not of much value unless, as in the present case, they are based on a very large collection of rolling stock. In 1900 the equipment of the German Union amounted to 28,534 locomotives, 21,344 tenders (which shows that nearly 25 per cent. of the locomotives are tank engines) and 676,300 vehicles of all sorts having 1,481,774 axles, which made during the year 1900 a total of about 17,000 million axle-miles. The number of axles in 1892 was 1,047,084, so that in eight years the number has been increased about 36 per cent. Of the above equipment about 65 per cent. is German, 29.5 per cent. belongs to Austria-Hungary and the remaining 5.5 per cent. to the smaller countries, Holland, Roumania, etc. Table 1 shows the number of failures in service. These

Table 1.—Axle Failures on the Railways of the German Union in the Years 1898-1900.

		Fractures.	Cracks.	Total failures.	No. cracks to each failure.
Locomotives	1898	40	125	165	
	1899	28	165	193	
	1900	33	157	190	
	3 yrs.	101	447	548	4.4
Tenders	1898	39	91	130	
	1899	41	105	146	
	1900	37	109	146	
	3 yrs.	117	305	422	2.6
Vehicles	1898	61	821	882	
	1899	52	678	730	
	1900	46	571	617	
	3 yrs.	159	2,070	2,229	13.0

are divided to show the number of fractures, and the number of cracks or flaws necessitating the removal of the axle without actual fracture. The table also shows the proportion of cracks to actual fractures. The number of fractures per 10,000 axles in service for the years 1892 to 1894 are as follows:

Locomotives ..... 2.90 fractures per 10,000 axles
Tenders ..... 7.08 fractures per 10,000 axles
Vehicles ..... 0.62 fractures per 10,000 axles

For the years after 1894 the number of locomotive axles is not given, but for the other axles the figures for 1898 to 1900 are:

Tenders ..... 6.54 fractures per 10,000 axles
Vehicles ..... 0.39 fractures per 10,000 axles

It will be seen that the tender axles show a much higher proportion of fractures than either the locomotives or the vehicles. The proportion of fractures is higher both in proportion to the number of axles in service and also to

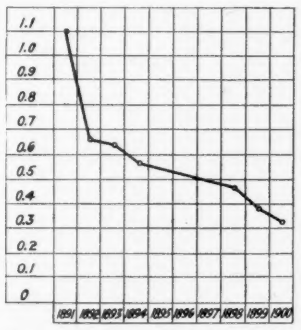


Fig. 1.—Axle Failures per 10,000 Axles in Service Shown by Years.

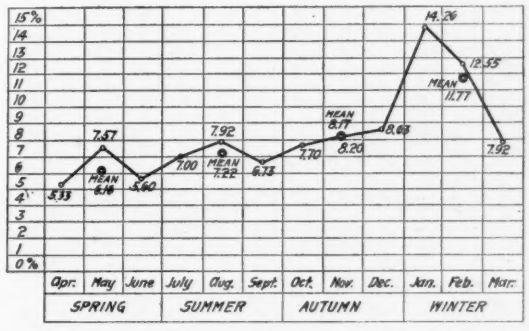


Fig. 2.—Distribution of Axle Failures Throughout the Year in Per Cent. of All Failures.

the number of failures other than actual fractures. Unfortunately the German tables do not give any information enabling any conclusions to be drawn from the high number of tender failures. Mr. Biard attributes the larger number of tender-axle failures to the fact that more tender axles than car axles are braked.

In the three years 1898-1900 the number of locomotive-miles run in service averaged 458 millions per year, with an average of 33.66 fractures per year, which gives 13½ million locomotive-miles per fracture, or 0.074 fractures per million locomotive-miles. In the same period the cars made a yearly average of 17,000 million axle-miles with an average of 53 fractures per year, making 320 million axle-miles per fracture, or 0.0031 fractures per million car axle-miles. It will be noticed that as the number of locomotives is given but not the number of their axles, the above figures for the locomotives are based on engine-miles, while for the vehicles the figures are based on axle-miles. It may be noted here that in the year 1900 each locomotive averaged 17,000 miles with an average train of 37 axles.

In the years 1892 to 1897 the 125 locomotive-axle failures were divided as follows: Main axles, 100, or 80 per cent.; coupled axles, 11, or 8.8 per cent.; truck or trailing axles, 14, or 10.2 per cent. No information is given as to the relative number of cranked and straight driving-axles which failed.

As is shown by the diagram (Fig. 1) the number of failures of car axles has shown a well-marked steady decrease, dropping from 1.1 fractures per 10,000 axles in 1891 to 0.325 failures per 10,000 axles in 1900. The French author attributes this largely to the retirement of the iron axles, which in 1891 amounted to about 80 per cent. of the total.

The axle failures are not distributed evenly throughout the year but are far more frequent during the winter than during the other seasons. The diagram (Fig. 2) shows the average results for the years 1888 to 1897, each month being marked with its percentage of the total number of failures. During the months from October to March 59.85 per cent. of the failures took place, while the milder months of April to September are only responsible for 40.1 per cent. Dividing the year into quarters, the failures are:

Spring.	Summer.	Autumn.	Winter.
April to June.	July to Sept.	Oct. to Dec.	Jan. to March.
Per cent.	Per cent.	Per cent.	Per cent.
18.50	21.65	24.53	35.32

The months of January and February are the most fatal for the axles and on an average one-quarter of all axle failures during the year occur during these two months. In exceptionally severe weather the increase in failures is even more strongly marked. For example, January, 1891, and February, 1895, are each responsible for a quarter of all failures during their respective years, while in 1893 one-third of all the axle failures took place in the single month of January. It will be observed that the number of failures is least in the spring and increases gradually through summer and autumn to the maximum in winter. The fact that the minimum number of failures is found in spring and not in summer is undoubtedly due to the fact that the frozen winter roadbeds try out the axles so severely that all incipient defects are brought to light and the axles replaced, so that the advent of spring finds the rolling stock with axles in excellent condition. This shows the desirability of extra care in the inspection of axles during the autumn.

During the period 1891 to 1897 the oldest axles removed on account of fractures or flaws had dates of manufacture and duration of service as follows:

Iron axles made 1848 to 1852; in service 40 to 45 years.
Crucible steel axles made 1862; in service 32 years.
Bessemer steel axles made 1864; in service 29 years.
Open-hearth steel axles made 1871; in service 24 years.

The average age of axles broken during the period from 1892 to 1897 is 20½ years.

The location of the fractures is as follows, the figures being the percentages of total fracture during the years 1892 to 1897:

	Per cent.
Broke at journal	53.23
Broke at wheel-fit	17.75
Broke near wheel-fit	19.35
Broke in the axle-body	7.52
Broke in an axle crank	1.21
Broke elsewhere	0.94
	100.00

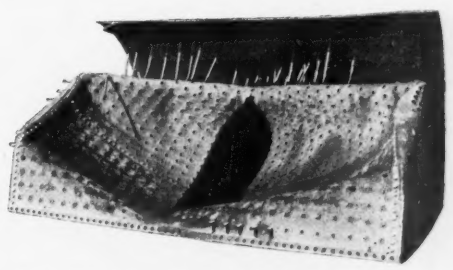
The following figures for the years 1898 to 1900 show where the defects were discovered which led to the condemning of the axles. The figures given are in per cent. of the total number of axles condemned during the three years for flaws and actual fractures.

	Locomotives and tenders, per cent.	Cars, per cent.	All rolling stock, per cent.
Defects discovered while running	16.40	4.00	7.90
Defects discov'd on examina'n in sta.	6.30	4.50	5.00
Defects discovered in shops	77.30	91.50	87.10

During the years 1898 to 1900 there were 3,450 derailments, the yearly average being 1,150, of which 30.3, or 2.64 per cent., were due to axle failures, and 26.3, or 2.29 per cent., were due to failures of tires or of wheels without tires. The percentage of total derailments due to axle or wheel failures was 4.93 per cent. In the period from 1892 to 1897, 11.15 per cent. of the axle failures were due to defective material and 5.52 per cent. were due to hot boxes.

A Boiler Failure.

The interesting engraving is from a photograph of a fire-box taken from a locomotive of the New York, Ontario & Western. The boiler was 12 years old and carried 160 lbs. pressure, but the fire-box was new, having been in service only about 30 days. The ruptured crown-sheet



Ruptured Crown-Sheet of N. Y., O. & W. Boiler.

is the full thickness—$^{5}/_{16}$ in.—except at the line of rupture. Here it is drawn down to a thin edge, as sharp as a knife in places.

There was not a broken staybolt in the boiler but every bolt was pulled through the sheet. The nine center rows, in addition to being screwed through the sheet, had nuts on the under side which were stripped off by the pressure above the heated sheet, and the bolts drawn through the sheet.

The flue and back sheets were distorted by the severe

stresses exerted by the crown-sheet before it separated. The outer shell, which was partly removed to enable the photograph of the fire-box to be taken, was also badly distorted as a result of the separation of the staybolts from the crown-sheet, and before the rupture relieved the abnormal pressure. The low-water line was clearly marked on the sheets.

The photograph is furnished by Mr. George W. West, Superintendent of Motive Power.

The New York Terminal of the Pennsylvania Railroad.

On October 1st, the engineers in charge of the proposed Pennsylvania Railroad tunnels under New York City and the North and East Rivers, gave out the plans and specifications for this tremendous undertaking, and asked for bids on the work. The undertaking is of such magnitude that it is proposed to describe it in three articles.

The plans provide for a tunnel starting on the west face of Bergen Hill, in New Jersey, and continuing under the hill and the town of Weehawken (almost exactly opposite 32d street, New York), thence under the North River and the Island of Manhattan to the East River, under the East River and Long Island City, emerging at a point a short distance north of Borden avenue in Long Island City. Two companies have been incorporated to carry on the work. One of these, the Pennsylvania, New Jersey & New York Railroad, has been incorporated to build all of that part of the tunnel and approaches in the State of New Jersey, and extending under the North River to the boundary line between the States of New York and New Jersey. The other company, the Pennsylvania, New York & Long Island Railroad, will construct the tunnel, terminal stations and yards, starting from the State line under the North River and extending under the Island of Manhattan, the East River and Long Island City. The officers of both of these companies are Pennsylvania Railroad officers, the President being Mr. A. J. Cassatt, President of the Pennsylvania Railroad. The plans for all of the work have been drawn up by an advisory board of engineers consisting of Lieut.-Col. Charles W. Raymond, Corps of Engineers, U. S. A., Chairman; Messrs. Gustav Lindenthal, Charles M. Jacobs, Alfred Noble, William H. Brown and George Gibbs. Mr. Charles M. Jacobs is the Chief Engineer in immediate charge of the execution of the work.

The tracks into the tunnel at Bergen Hill leave the present line of the Pennsylvania at Harrison, opposite Newark. (See *Railroad Gazette*, Sept. 19, 1902.) The line will then pass under the hill through twin tunnels spaced 37 ft. apart from center to center, driven through the rock, on a gradually descending grade. This portion of the work is known as section K, and extends from the west portal to the Weehawken shaft, a distance of 5,910 ft. The grades will be 1.1 and 1.3 per cent. At Weehawken, a shaft will be sunk from the surface to the level of the tunnel at this point, and from this shaft the tunnel will be driven into the hill and under the river simultaneously.

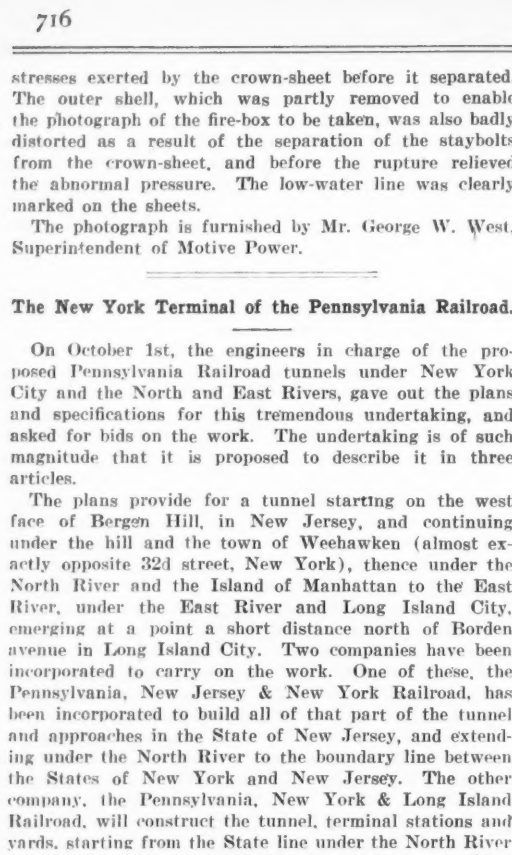


Fig. 4—Section through Tunnel under the North River Supported on Screw Piles.

Section I includes the shaft and the opening in the tunnel at the foot of the shaft. Section Gj comprises the tunnel from the Weehawken shaft to the State line between New Jersey and New York, which is approximately in the center of the North River. Sections K, I and Gj will be built by the Pennsylvania, New Jersey & New York. Section Gy is that part of the tunnel extending from the State line eastward under the river and the Island of Manhattan to the west side of Ninth avenue in the City of New York. This includes a continuation of the twin tubes under the river, a small section of 34 ft.-span, double-track tunnel, a section 1,096 ft. long of triple tunnel containing four tracks under three spans, and a section 605 ft. long of four-track tunnel under one span. This brings the tunnel to the terminal station site at Ninth avenue and 32d street. The line extending eastward from the terminal station under the East River and into Long Island City, will be described later. The present article will deal only with that section of the tunnel to be constructed by the Pennsylvania, New Jersey and New York Railroad from Bergen Hill to the center of the North River.

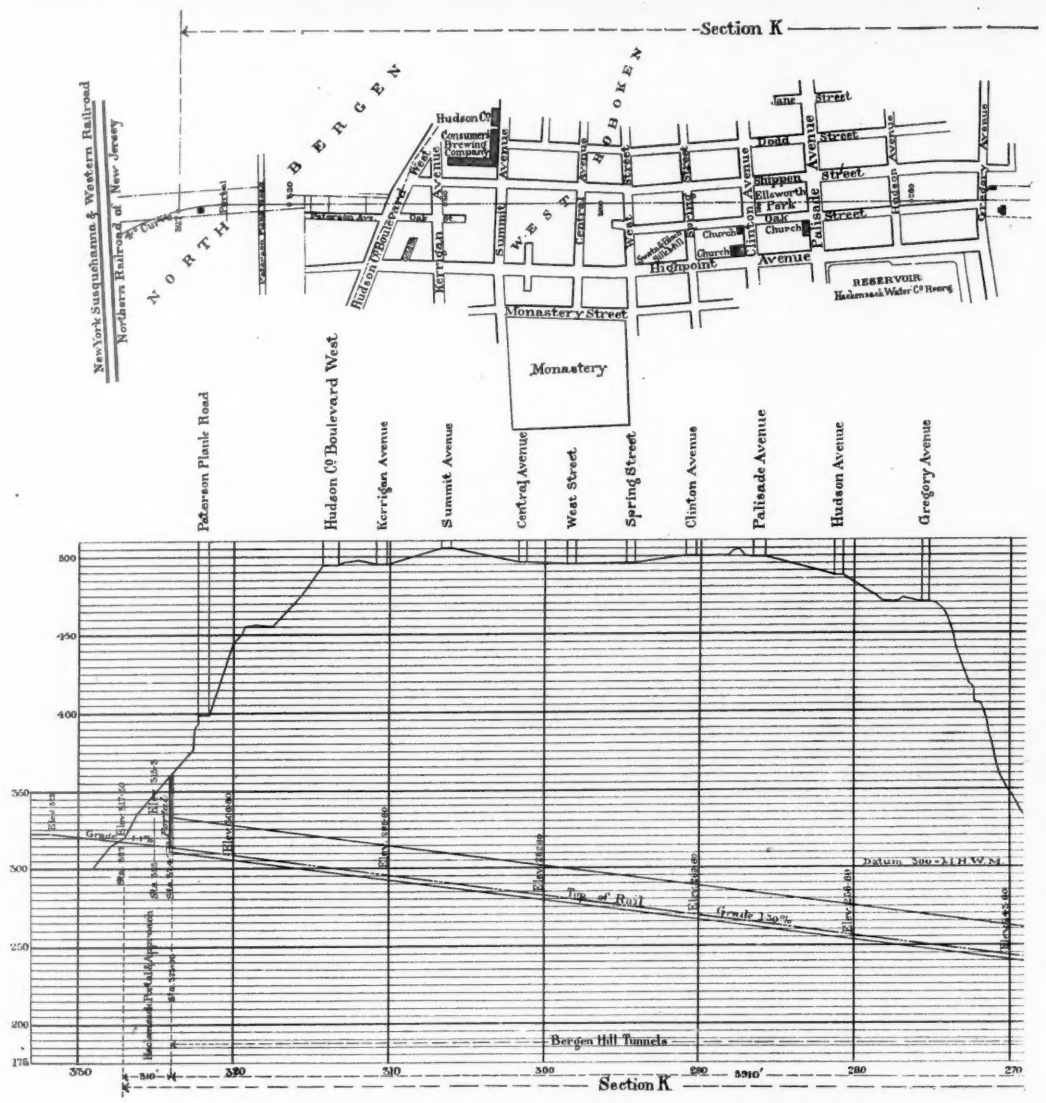


Fig. 1—Plan and Profile of Tunnels under Bergen Hill—Pennsylvania Railroad.

Proposals have been asked for each section of the work separately, but the bidders will, of course, be at liberty to make proposals for any or all of the work. The accompanying engravings, reproduced from the contract drawings, show some of the more important details of the work and the general plan of construction. Figs. 1 and 2 show the plan and profile of the tunnels from the Bergen Hill portal to the terminal station site in New York City. The double-track line from the west, will approach the portal on a 4 deg. curve. About 800 ft. west of the portal the line begins a gradual descent on a grade of 1.1 per cent. There is a cut in the side of the hill 310 ft. long, before the tunnel entrance is reached, and the hill is cut down at the face of the portal 45 ft. The descending grade of 1.1 per cent. extends about 4,500 ft. into the hill, where it is increased to 1.3 per cent. to a point about 700 ft. east of the bulk-head line on the Jersey side of the river. At this point the line begins to ascend on a .53 per cent. grade, which is continued into section Gy. The maximum depth of the tunnel is about 220 ft. under Bergen Hill immediately beneath Palisade avenue. The depth at the Weehawken shaft is about 70 ft. and the maximum depth of the top of the tunnel below mean high water under the river, is 70 ft.

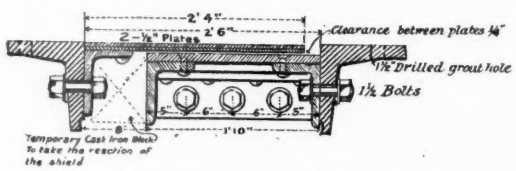
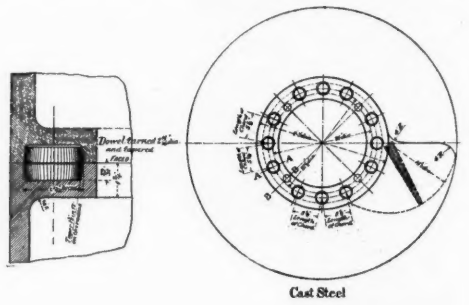

2' 4"
2 - ¾" Plates
2' 6"
Clearance between plates ¼"
1¼" Drilled grout hole
1½ Bolts
Temporary Cast Iron Block To take the reaction of the shield

Fig. 7—Section through Sliding Rings.

Under Bergen Hill the tunnel will be driven through rock, and will be lined with concrete. The Weehawken shield chambers are 224 ft. east of the Weehawken shaft. For a distance of 160 ft. east of the shield chamber the tunnel rests on solid ground, without pile foundation, and will be lined with cast iron rings similar in every way to those used where the foundation is on soft ground and steel piles are to be used. From the end of the cast iron tunnel resting on solid ground to the bulkhead line on the Manhattan side of the river, a distance of 4,859 ft., both tubes will be cast iron lined and will rest on steel screw piles, which will be driven to a suitable depth for a solid bearing.

Fig. 3 shows a typical section through the tunnels under Bergen Hill. The east and westbound tunnels are similar in every respect, and are entirely independent of each other except at such points where crossheaders will be run to contain circuit breakers or other apparatus, and to permit entrance from one tunnel to the other without going to the portals at either end. The



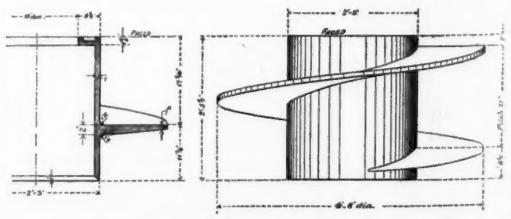
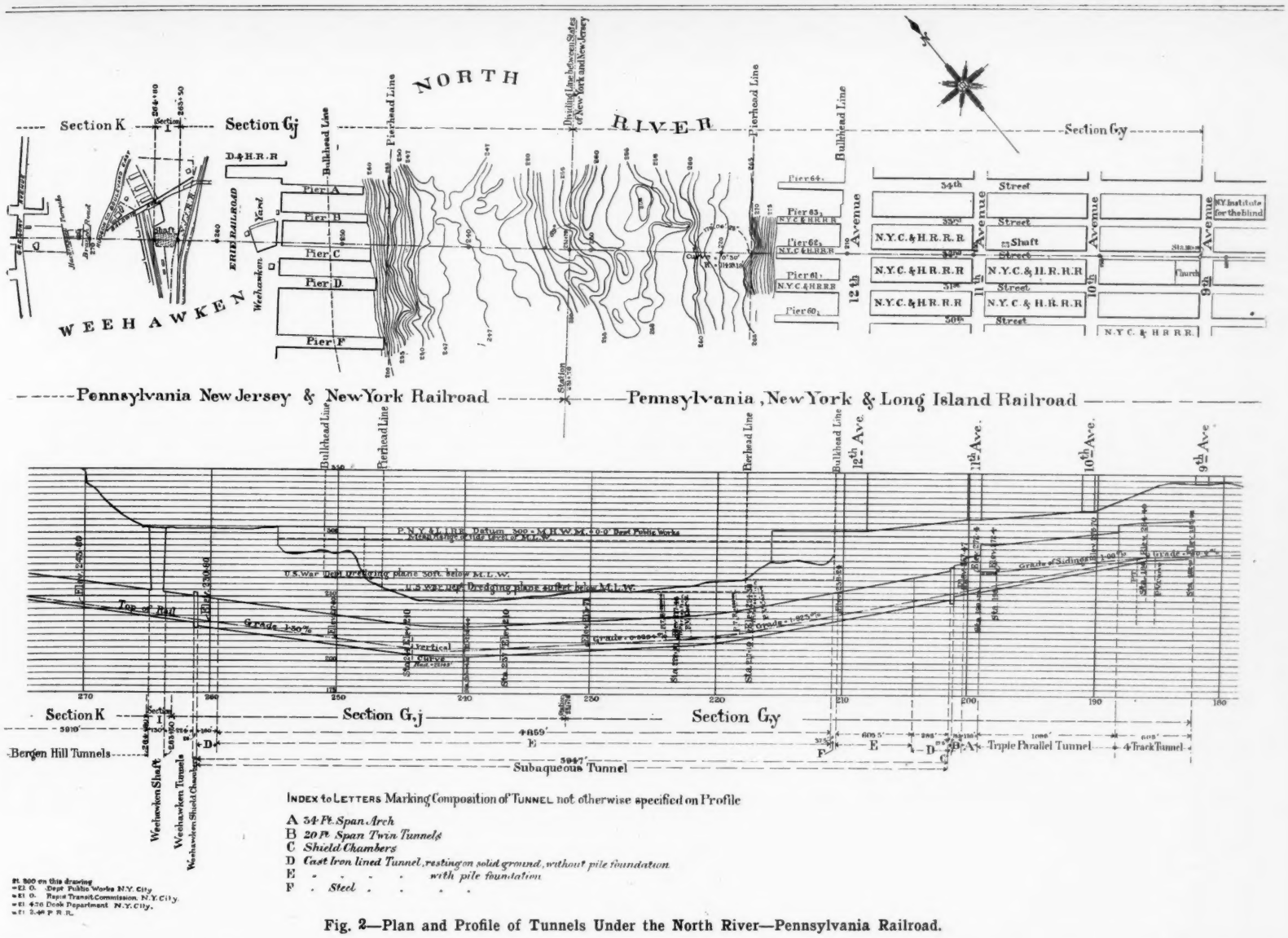


Fig. 6—Screw Pile Point and Detail of Joint between Sections of Pile.

radius of the inside of the arch is 9 ft. 6 in. The masonry arch will be 22 in. thick and above that the space between it and the excavation will be filled with loose rock grouted under pressure. Cast iron drain pipes, 4 in. in diameter, will be carried down along the sides of the tunnel and empty into drains in the floor, to drain the top surface of the arch. The outside surface of the



Ft. 300 on this drawing
=El 0. Dept Public Works N.Y. City
=El 0. Rapid Transit Commission, N.Y. City.
=El 4.76 Dock Department N.Y. City.
=El 3.46 P.R.R.

Fig. 2—Plan and Profile of Tunnels Under the North River—Pennsylvania Railroad.

masonry will be protected by a waterproof coating of pitch and felt paper, laid in alternate layers. Telephone and telegraph wires and low and high tension power cables will be carried in vitrified conduits set into the concrete as shown in the section. The projections of the concrete on both sides of the tunnel form a narrow shelf, or ledge, 3 ft. 8 in. wide, approximately on a level with the car windows, affording a ready means of access from the cars in case of accident and a suitable path for track inspectors and the electricians who may be working on the circuits in the conduits. Refuge niches are formed in these concrete walls at frequent intervals for the safety of any trackmen who may be at work in the tunnel.

The Weehawken shaft has been let as a special contract, and will be ready for the contractor when the engineer deems it advisable to proceed with the sections of work to be carried on from this shaft. The power wires for the operation of the tunnel will be introduced at this point through a special power tunnel, the construction of which is included in the present contract. This tunnel will run under the tracks and will have headers leading off from it to manholes in each main line tunnel where the high tension wires will be led into their proper conduits.

The Weehawken shield chambers, from which the shields for driving the tunnel under the river will be started, are 26 ft. 6 in. wide and 28 ft. 6 in. high inside the neat line. As before noted, for a short distance out towards the river from this point, the shields will be advanced through soft earth but will rest on solid ground, so that no piles will be used to support the tubes.

Fig. 4 shows a section through one of the cast iron lined tubes arranged to be supported on the steel piles. Other sections not so supported are similar in every respect with the exception of the sleeves and plugs for capping the piles after they have been driven. The details of the joints between these tunnel rings are shown in Fig. 5. For a short distance, on the New York side, cast steel rings will be used instead of cast iron rings, but the details for both are exactly alike. The interior section in this part of the tunnel will be very similar to that portion under Bergen Hill, the inside radius will be the same, 9 ft. 6 in., but the arch will be concrete, 2 ft. thick. A thin shell of grout, about 3 in. thick, will be laid over the entire exterior surface of the cast iron rings, by forcing it under pressure through holes provided in the rings. The rings will be built up in sections, each ring being 2 ft. 6 in. wide, the entire circumference being made up of 11 segments and a key. The segments will vary in length from 6 ft. 5.55 in., to 6 ft. 5.99 in., measured on the outside circumference. They will be 1½ in. thick and all the flanges will be machined. When bolted up they will be practically water-tight.

Steel piles on which the tubes will rest will be driven in sections 7 ft. long, and will be hollow, the outside diameter being 2 ft. 3 in. and the thickness of the wall 1¼ in. They will be joined together by four 1⅜-in. bolts and 12 steel dowels. The details of this fastening are shown in Fig. 6 as well as the screw point. This point will have a pitch of 21 in. and the thread will be 4 ft. 8 in. in diameter. In case the piles required, will be comparatively short, the screw points may be omitted and the end of the piles embedded on a solid foundation which will be previously dressed by sinking a sleeve and removing the soil which is forced up through the sleeve. Where the tunnel emerges from a solid foundation and passes to a soft foundation, supported on piles, sliding

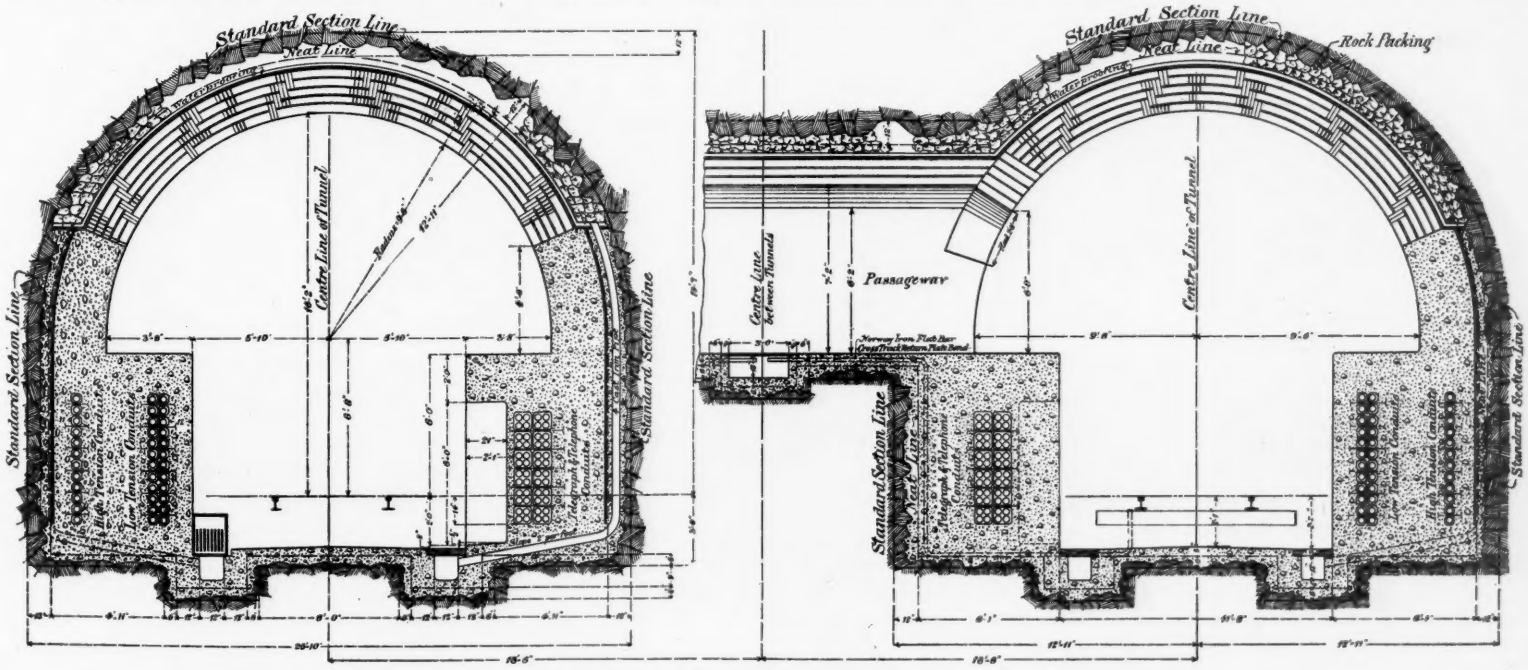


Fig. 3—Typical Section through Tunnels under Bergen Hill.

rings, shown in Fig. 7, will be introduced in the lining to compensate for any settling of the tube due to the differences in foundation. These will also provide for expansion and contraction.

The specifications are very complete and cover all of the materials and methods to be used in the tunnel. At the same time, they do not introduce too many limiting conditions on the contractor and allow considerable deviation subject to the approval of the engineer. This is particularly true of the method for driving the tunnels under the river. Every precaution is to be taken to prevent accidents during construction and to provide comfortable and safe quarters for the men employed in the air locks in tunnels. Work to be done in compressed air is to be carried on day and night without any interruption or intermission, and work not done in compressed air will also be carried on continuously, day and night, except on Sundays and legal holidays; but the engineer, in case of necessity, may order that this work also be carried on without any intermission.

The railroad company undertakes to furnish to the contractor all the Portland cement necessary for the

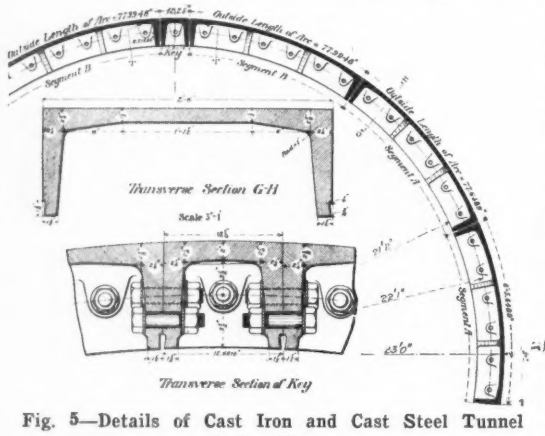


Fig. 5—Details of Cast Iron and Cast Steel Tunnel Lining Rings.

work at $2 for 380 lbs. The company will deliver this to suitable storehouses and guarantees to keep on hand, at all times, a sufficient supply. The company also undertakes to dispose of all excavated material, which is to be delivered to barges and scows placed within a specified distance from the opening of the shaft. For a period of 12 months after the tunnel shall have been completed to the satisfaction of the engineer, the company will maintain and keep it in serviceable condition at the expense of the contractor. The prices named for each section of the tunnel are given as unit prices per lineal foot, and all additions or deductions made because of a change in plans, or in methods employed, will be computed on the basis of these unit prices and payments made in accordance with them. This gives an equitable and convenient method of computing monthly payments to the contractor and in estimating the cost of any additional work which may be required.

The method of driving the tunnel in soft ground is not specifically laid down; the contractor being required to submit detailed plans and specifications of all the machinery and appliances to be used to the engineer, and by him inspected and approved. Duplicate machinery, including boilers, air compressors and hydraulic appliances, must be installed to meet emergencies, and provision made for storing of boiler feed water for 12 hours' supply. When blasting is resorted to special means must be provided for quickly removing the fumes produced. Bulk-heads will be built in each tunnel at intervals not exceeding 1,000 ft. These bulk-heads must be provided

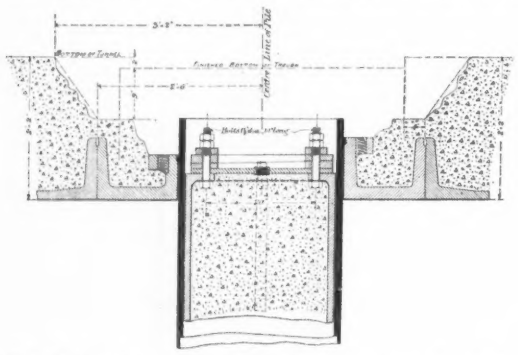


Fig. 8—Section Through Top of Screw Pile and Bore Segment.

with air locks for the passage of men and materials, and an emergency lock for the passage of men only, near the roof. All the machinery and locks must be capable of exerting or withstanding a pressure of 55 lbs. per sq. in., although it is not probable that such a high pressure will be required in any portion of the tunnel.

In placing the segments of tunnel lining the cast steel bore segments at the bottom, through which the screw pile will pass, will be placed first in perfect alinement. Cast iron plugs must be furnished by the contractor to temporarily fill the holes in these segments through which the screw pile will be subsequently driven. Immediately before the screw pile is to be placed, these plugs will be removed. As the length of the screw piles cannot be definitely pre-determined, after the pile has been set the top section will be withdrawn and a special section of the necessary length will be put in place. It is assumed that the ground will rise in the screw piles almost to the top. This ground is to be removed to a depth of 12 ft. and the pile filled with concrete up to the under side of the steel diaphragm plate. A wrought iron pipe 2 in. in diameter will be built in the center of the concrete column, extending vertically through it, and through this pipe, cement grout will be injected under a pressure of 100 lbs. per sq. in. The track in the tunnel will be laid on a bed of concrete resting directly on these piles, so that a large part of the load will be transferred to the solid foundation without in any way affecting the tube.

The article next week will deal with the section of the tunnel from the center of the North River to Ninth avenue, the proposed site of the terminal station in New York.

A Rational Method of Design of Locomotive Frames.*

Some 100 designs of the representative product of important roads in the United States, Canada, and Mexico have been examined for data. Failures are often incorrectly attributed to insufficient sectional area at certain parts. Cases are recorded where non-alinement, lack of lateral play, or binding of expansion pads or braces, have caused failures, which were treated in new designs with an increase in section. To-day it is almost an axiom of criticism that a heavy frame is "a good fault." One thousand pounds unnecessary weight in a pair of frames, for each of 1,000 engines making 50,000 miles a year, assuming 15 years as the life of the engines, means 375,000,000 tons hauled one mile. At $.0002 as the maintenance and transportation cost of one ton one mile, this gives $75,000. Assuming 1,500 as train tonnage, it would take five of these engines an entire year, to move this extra frame load.

An analysis shows a wide variation in practice. The need of a rational method of design is clearly proven by the monetary illustration. The weight on drivers being the fixed unit of measurement of power of the locomotive, by subdividing into classes based on the number of drivers, we have a basis for analysis. At first thought this meets with the objection that cognizance is not taken of the spacing of wheels. Examination of conditions when thus subdivided will show that these variations are within comparatively narrow limits. With a longer wheel base and equivalent section, there is a factor of flexibility which is neutralized by this subdivision, and which is not found if the frame is designed with sectional increments for each increase of wheel base. The relative placing of supports to the boiler, governed by the equalizer rigging and springs, is so nearly constant in modern locomotive construction that its absence as a factor in this method of analysis is not important.

The problem has first been treated graphically, and from this analytically. Curves are plotted (Fig. 1) using the weight on one pair of drivers as ordinates and the area of section at selected parts as abscissæ. These sections have been taken in the planes A-A, B-B, C-C, D-D, E-E, F-F, and G-G in the diagrams (Fig. 2), located relatively the same on all classes of frames. Average practice will be given by a line so laid that the sum of the distances from it of all points is the same for each side.

The maximum and minimum limits of average practice are represented by the lines so marked. The influence as a determinant of any one point representing widely divergent practice is reduced in locating these lines. The moment of each point has been gaged as nearly as possible to accord with the number of engines which it represents, with their rating.

Taking the equation of a straight line, $y = ax + b$, in this case $b = o$; therefore we have by solution the following data, assuming hammered iron as a basis:

Class.					
	A—A = .059	× Wt.	on	pair	of drivers.
0-8-0	B—B = .0475	× "	"	"	"
2-8-0	C—C = .0325	× "	"	"	"
2-8-2	D—D = .051	× "	"	"	"
4-8-0	E—E = .043	× "	"	"	"
4-8-2	F—F = .033	× "	"	"	"
	G—G = .044	× "	"	"	"
Class.					
	A—A = .05	× "	"	"	"
0-6-0	B—B = .0416	× "	"	"	"
2-6-0	C—C = .0275	× "	"	"	"
2-6-2	D—D = .044	× "	"	"	"
4-6-0	E—E = .036	× "	"	"	"
4-6-0	F—F = .0285	× "	"	"	"
	G—G = .0395	× "	"	"	"
Class.					
	A—A = .0475	× "	"	"	"
	B—B = .038	× "	"	"	"
2-4-0	C—C = .0265	× "	"	"	"
4-4-0	D—D = .043	× "	"	"	"
4-4-2	E—E = .0345	× "	"	"	"
	F—F = .0265	× "	"	"	"
	G—G = .0386	× "	"	"	"

Thus, having given the weight on drivers and the type of engine, use of a constant and a simple multiplication gives the required section, according to present practice. According to this method a consolidation frame with 42,000 lbs. on one pair of drivers would have the following dimensions:

A—A	= .059 × 42000	= 24.78	= 4½ in.	× 5½ in.
B—B	= .0475 × 42000	= 19.95	= 4½ in.	× 4½ in.
C—C	= .0325 × 42000	= 13.65	= 4½ in.	× 3 in.
D—D	= .051 × 42000	= 21.42	= 4½ in.	× 4¾ in.
E—E	= .043 × 42000	= 18.06	= 4½ in.	× 4 in.
F—F	= .033 × 42000	= 13.86	= 4½ in.	× 3 in.
G—G	= .044 × 42000	= 18.48	= 4½ in.	× 4 in.

For binders, the cast-steel thimble with bolt is mostly used for engines up to 42,000 lbs. on a pair of drivers, where they are readily accessible for adjustment. Where hampered by underhung spring rigging, etc., or above this weight, a well-arranged binder bar is preferred. It gives greater stiffness to the frame, but is expensive to readjust in the roundhouse. A binder bolt of comparatively soft material will respond more readily to a slight pound than if of high tensile strength. Therefore care must be taken to specify suitable material.

Hammered iron is the favored material for frames ex-

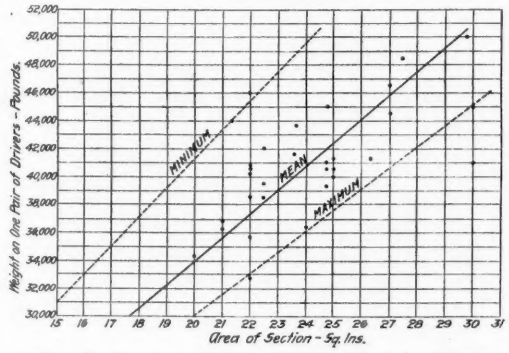


Fig. 1—Typical Curves of Practice in Frame Dimensions.

Section A-A for 0-8-0, 2-8-0, 4-8-0 and 2-8-2 types.

cept in cases of heavy forgings, where cast steel is employed. Usually the section is the same whether of iron or steel. This may be accounted for by the spirit of standardization now prevalent, but why this should hold for new designs is not as apparent.

Hammered iron has the distinctive advantage of being readily welded. Results with steel leave some things to

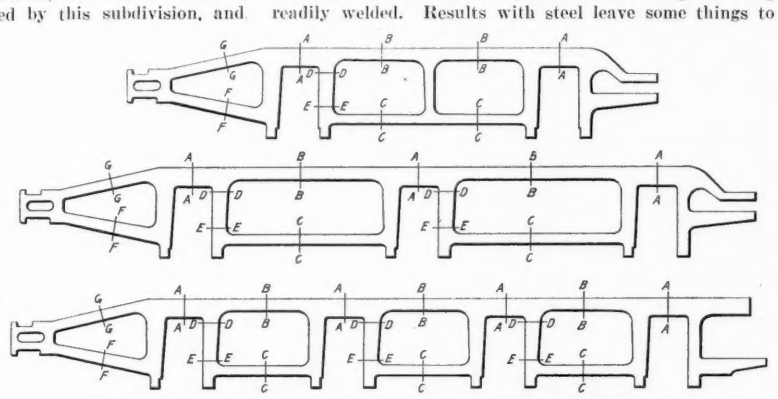


Fig. 2—Frame Diagrams Showing Location of Section Planes.

be desired. Blow-holes and honey-combing occur in steel, ofttimes being hidden in the heart of the section. But failures of hammered iron frames in many instances are correctly attributable to the presence of steel in the scrap. With hammered iron, we are practically limited to the rectangular section, whereas cast steel may be moulded to meet any conditions.

Taking a frame section of 27 sq. in. with the condition that it be 6 in. x 4½ in., the moment of inertia about the vertical axis is 45.5, and about the horizontal, 81. Suppose this material arranged in an I section 7½ in. high, 6 in. wide, 2

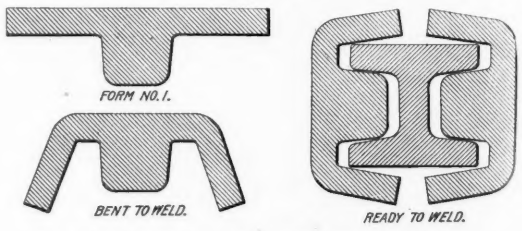


Fig. 3—Method of Repairing I-Section Frame.

in. thick at web and 1½ in. at flange. We then have about the vertical axis, 57; about the horizontal, 180.5, giving for practically equivalent sections:

	I-section.	Rect. section.
Moment about vertical axis.....	57	45.5
Moment about horizontal axis.....	180.5	81

Another advantage of the I-section is that it may be arranged with the moments the same at all other parts as through the bolt holes.

Machining is another important point. Raised bosses at points which need to be finished reduce this part of the cost considerably for all designs in steel, irrespective of section. If, as is believed by some, the outer unfinished section of a steel casting is stronger than the interior, a sub-advantage is also secured.

*Abstract of a paper presented at the September meeting of the Pacific Coast Railway Club by G. S. Edmonds, Mechanical Engineer, Delaware & Hudson.

Probably no subject is of greater moment and open to more fruitful investigation than the chemical and physical constituents of cast steel best adapted to use in the modern locomotive. Should we sub-divide our requirements into two or more classes when arranging cast-steel specifications, considering frames to be the more exacting in the proportions of their constituents? Take, for illustration, a guide-yoke bracket compared with a frame. A failure with the first is of minor importance, while with the other the consequences as to cost are relatively heavy. Carbon present in any considerable percentage is an enemy to welding. With the bracket this is of small moment; with the frame it demands serious consideration. Phosphorous may cause the product to be brittle under shock. Manganese, which counteracts the hot-shortness due to sulphur, may cause failure when welds are necessary. The need of a separate specification is apparent.

Following are data covering actual or specified conditions governing these castings:

Physical.

Tensile strength.	Elongation in 2 in.
Minimum.....60000	Minimum.....15 per cent.
Maximum.....70000	Maximum.....30 per cent.

Chemical.

	Minimum.	Maximum.
Phosphorous	.03	.075
Manganese	.25	.80
Silicon	.016	.35
Sulphur	.022	.0505
Carbon	.19	.35

Another point is the necessity of annealing a frame casting. Are the shrinkage effects in a frame relatively low in carbon such as to warrant this additional cost?

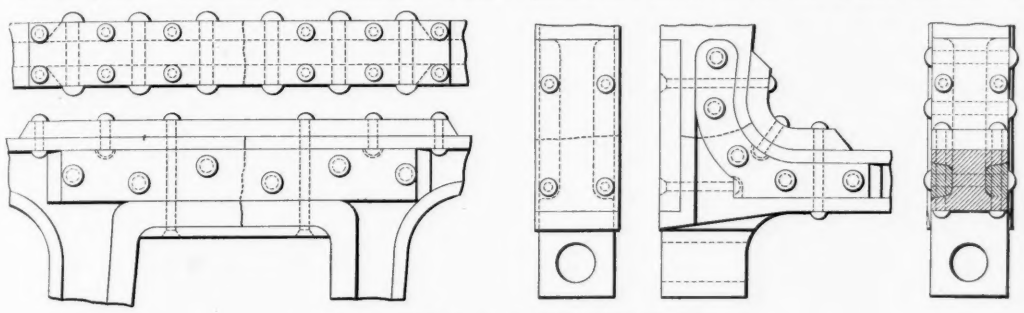


Fig. 4.—Plate Repairs to I-Section Frame.

In the foregoing we find the rectangular bar section almost a standard. A number of reasons suggest themselves for this, four being here given:

1. A selection of any form of web section makes necessary a careful and complete design of engine before making the pattern, as proper provision for all bolts and braces is absolutely essential. The present demand for steel castings, and slow delivery, may in part be the reason for the adherence to this section.

2. The seeming advantages of this section for repairs account for its adoption in some cases.

3. Structural conditions being such as to limit cross bracing, making considerations of side stiffness of the frame important, doubtless have entered as a factor in other instances.

4. Uncertainty of the cast-steel product, due to blowholes, etc., has given favor to this section, which, by its larger sectional area insures a higher factor of safety.

But we know that:

1. A web section gives us higher moments of inertia per unit weight than any other.

2. A frame casting is such that the use of coring must be eliminated, else first cost will be excessive, with possibilities of shifted cores.

3. The second condition reduces the number of available web sections to channel and I.

Moulding, with shrinkage effects, makes the latter seem decidedly the more desirable of the two. Subject it to the criticisms given in the preceding four reasons:

1. This is purely a question of a small amount of extra time before ordering material.

2. The question of repairs in case of failure is more serious. But suppose our frame designed with the webs of such section that, when heated, practically all parts attain the same temperature at the same time. In another fire are two like pieces also raised to a welding heat (Fig. 3). These we jump in on either side, and after cooling, mill the section to original dimensions. With the rectangular section of steel, the outside and inside are of different temperatures and the weld materially less certain than in the above method. Again, the power necessary to weld a heavy section is often wanting. With small pieces this is overcome. In a rush season, a plate repair (Fig. 4) can be made and the engine run an indefinite period.

3. Few cases arise where we cannot increase, in a new design, the width of section at such parts to secure the proper moment of inertia about the vertical axis.

4. The comparative thinness of the I casting allows a ready and careful examination by the inspector, whereas with the rectangular sections, ofttimes the outer surface covers a multitude of sins, discovered only when failure of the part discloses interior honey-combing. Hence, while of a higher factor of safety if sound, the uncertainty of the material favors the I section.

With the foregoing as a basis, a frame for a 4-4-0 passenger engine has been designed, and is shown in Fig. 5.

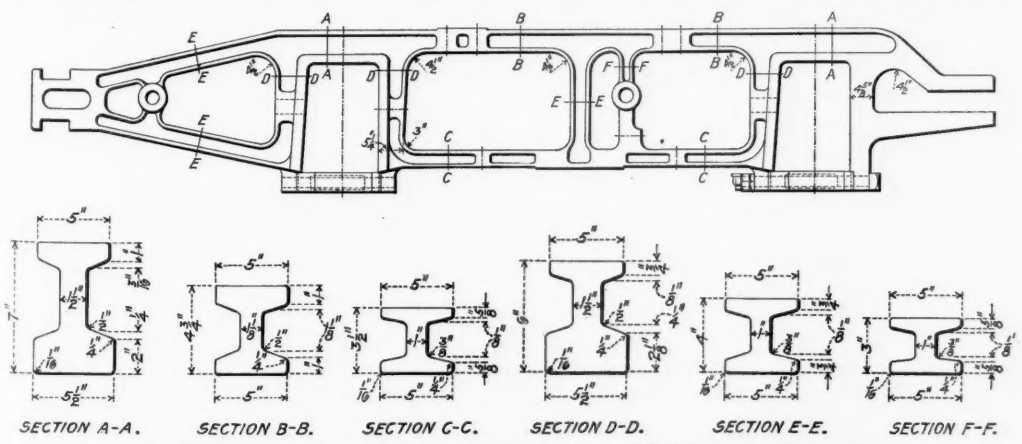


Fig. 5.—Design of Cast-Steel I-Section Frame for a 4-4-0 Passenger Locomotive.

Special Tools at the Roanoke Shops of the Norfolk & Western.

A simple and interesting special tool in use at the Roanoke shops of the Norfolk & Western is a chuck for holding the bushings for the circular steam chests for piston valves, while the port openings are being cut. It is common practice in doing this work to face out these openings on a slotter, or even with a chisel and file. The chuck shown in Fig. 1 makes it possible to do it much more rapidly upon a milling machine. It consists of a cast-iron base, A, bolted to the platen of the milling machine beneath the spindle. The bushing is slipped over the central bolt and held with its end firmly against the vertical end of the chuck, by a plate, B, held by the nuts on the bolt. The weight is carried, and the bushing itself is centered, by the double inclines, C C. The milling cutter is carried on the spindle above the bushing and the latter is fed against it and traversed the length of the opening. When the cut has been made from bridge to bridge, the bushing can be turned to a new position simply by loosening the nut. The vertical plate has a slotted hole to permit the adjustment of the bolt to different diameters of bushings.

Drilling and reaming the holes in the legs of the pedestals of locomotive frames is done by the tools shown in Figs. 2 and 3. Fig. 2 is the drill proper and consists of a frame, D, in which there are bearings for the two shafts carrying the miter gears. One of these shafts is tapered to fit the spindle of a drill-press and the other is short, merely extending through the bearing with a collar on the outside to hold the gear in position. This shaft is hollow but is fitted with a key to drive the shaft E, which is cut with a keyway throughout its whole length. The outer end of this shaft is bored to receive the drill or cutter for boring the hole, while the inner end is threaded for the feed screw, F. The latter is smooth at the outer end and turns in a bearing in the frame. Outside the latter it carries a friction wheel, G, and ends in a center, H.

In operation, the frame is held in the spindle of the drill-press and set between the legs of the pedestal. The friction wheel is turned and the center and drill run out until they come to bearings against the opposite faces. The spindle of the drill-press is then started and as it turns the spindle, E, with the feed screw, F, and the friction wheel, G, revolve together. Under these conditions there is no feed to the spindle, E. The tongs, A, are then set over the friction wheel and a pressure of greater or less intensity brought to bear upon it. This frictional resistance checks its motion and causes the spindle to run out. The concentricity of the drilling with the marking can be examined by slacking back the friction wheel and turning the whole frame out of the way on the drill spindle. When one hole has been drilled its mate is finished by reversing the frame by turning it on the spindle.

After the two holes have been drilled they are reamed by the bar shown in Fig. 3. This is a simple boring bar carrying two milling cutters. The one at the end is loose and is taken off while the bar is slipped through one hole. The two are then brought to a bearing at the same time, and driven through their respective holes by a hand ratchet and screw feed. This insures a perfect alinement of the two holes and does away with the filing and chipping of the pedestal holes.

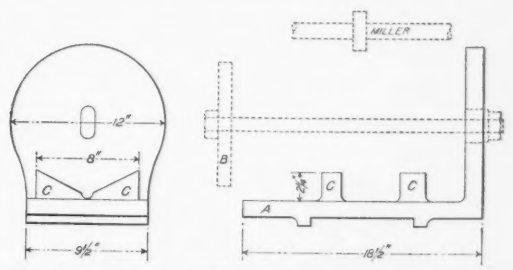


Fig. 1.—Chuck for Milling Valve Bushings—Roanoke Shops.

Draining and saving the oil from the chips of metal that has been worked with an oil cut is one of the small economies profitably practiced at these shops. A shed is provided where the chips are stored in bins with perforated bottoms through which the oil drains into a receptacle beneath. The oil thus saved is used again and the amount recovered far more than pays the slight attendant expense in doing the work.

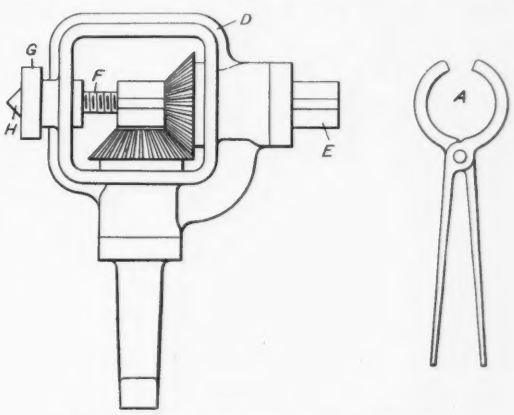


Fig. 2.—Pedestal Drill—Roanoke Shops.

The removal of pins, bushings and piston rods is always a matter of more or less difficulty, and hydraulic and gunpowder starters form a part of the equipment of every shop. The starter used at Roanoke is shown in Fig. 4. It consists of a forging, A, bored out to take a plunger, B, 1½ in. in diameter and fitted with a leather cup packing. From the bottom of the cylinder a hole ½ in. in diameter leads to a larger one 1 in. in diameter. In the latter is a screw, the end of which bears against the oil or tallow with which the space beneath the plunger is filled. With 50 lbs. pull applied to the end of a 14-in. wrench on this screw, a pressure of about 30,000 lbs. can be exerted on the plunger, and against a pin.

Fig. 3.—Pedestal Boring Bar—Roanoke Shops.

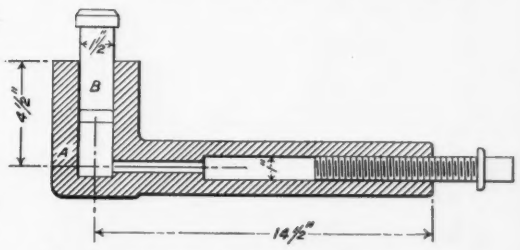


Fig. 4.—Hydraulic Pin Starter—Roanoke Shops.

It has been found to be quite practical and economical in the shops to use ball bearings on emery wheel shafts. The cost of fitting them in the first place is somewhat in excess of that for the ordinary bearings, but the decreased resistance to rotation as well as the greater steadiness of the grinding surface, taken with the increased time of service between repairs warrants the expense.

The subject of tube welding is one of perennial interest. At Roanoke butt welding is used with very satisfactory results. There are many methods of swaging down the ends of tubes, but these shops have a new one in the use of an old Sergeant rock drill, fitted with a set of dies for this purpose.

Tandem-Compound "Santa Fe" Type (2-10-2) Locomotive for the Santa Fe.

The Atchison, Topeka & Santa Fe is receiving from the Baldwin Locomotive Works 70 "Santa Fe" or 2-10-2 type locomotives. Twenty-five of these engines are designed to burn soft coal, the balance being oil burners. The accompanying illustrations show one of the coal burners. These locomotives have the distinction of being the heaviest ever built for regular road service. For several years the Santa Fe has had in service heavy locomotives of the consolidation (2-8-0) type and decapod (2-10-0) type, all of which have been illustrated in the *Railroad Gazette*. In the issue of April 3, 1903, was shown the details of one of a lot of 25 Mikado (2-8-2) type locomotives, which approached in total weight and power the heavy locomotives previously in use on the Santa Fe. The following table gives the principal dimensions of the "Santa Fe," decapod and "Mikado" locomotives:

	Santa Fe.	Decapod.	Mikado.
Total weight, lbs.	287,240	267,800	260,000
Weight on drivers, lbs.	234,580	237,800	200,000
Heating surface, sq. ft.	4796.0	5390	5366
Grate area, sq. ft.	58.5	58.5	58.5
Cylinders, in.	19 & 32x32	19 & 32x32	18 & 30x32
Diameter of drivers, in.	57	57	57

The new locomotive is 19,440 lbs. heavier than the decapod, which heretofore has been the heaviest in the world. The decapod, however, has 3,220 lbs. more weight on drivers than the "Santa Fe" type. The cylinder power of both engines is the same, the tractive effort being about 62,000 lbs. The boiler of the new engine is the same in general design as the boiler of the decapod locomotive, except that the new locomotive has but 391—2¼ in. tubes 20 ft. long, whereas the decapod has 463—2¼ in. tubes 19 ft. long, the respective areas of cross-section of boiler barrel occupied by the tubes being 38 and 32 per cent. The new engine has 594 sq. ft. less heating surface than the decapod, but the improved circulation in the boiler of the former will, no doubt, increase the efficiency of each square foot of tube heating surface. The wider spacing will also facilitate cleaning the boiler and lessen the accumulation of scale. Both engines have the same grate area, fire-box heating surface, and boiler diameter. For the details of the cylinders the reader is referred to the *Railroad Gazette*, May 30, 1902, p. 393. The boiler has an extended front-end 94½ in. long.

Some of the typical ratios follow:

Wt. on drivers divided by maximum tractive effort	3.7
Wt. on drivers divided by total heating surface	48.9
Heating surface divided by grate area	82.0
Tube surface divided by fire-box surface	21.8
Ratio of cylinder volumes	2.84
Steaming capacity*	.261

The following table gives the general dimensions of the locomotive:

Weight on drivers, lbs.	234,580
Weight on front truck, lbs.	23,420
Weight on trailing wheels, lbs.	29,240
Weight, total, lbs.	287,240

General Dimensions.

Wheel base, total of engine	35 ft. 11 in.
Wheel base, driving	19 ft. 9 in.
Wheel base, total engine and tender	66 ft.
Heating surface, fire-box	210 sq. ft.
Heating surface, tubes	4,586 sq. ft.
Heating surface, total	4,796 sq. ft.
Grate area	58.5 sq. ft.

Wheels and Journals.

Drivers, number	10
Drivers, diameter	57 in.
Truck wheels, diameter	29¼ in.
Trailing wheels, diameter	40 in.
Journals, driving axle	11 in. x 12 in.
Journals, truck	6½ in. x 10½ in.
Journals, trailing	7½ in. x 12 in.

Cylinders.

Diameter	19 in. and 32 in.
Stroke	32 in.
Valve	Balanced piston

Boiler.

Type	Wagon-top
Working pressure	225 lbs.
Diameter	78¾ in.
Staying	Radial

Fire-box.

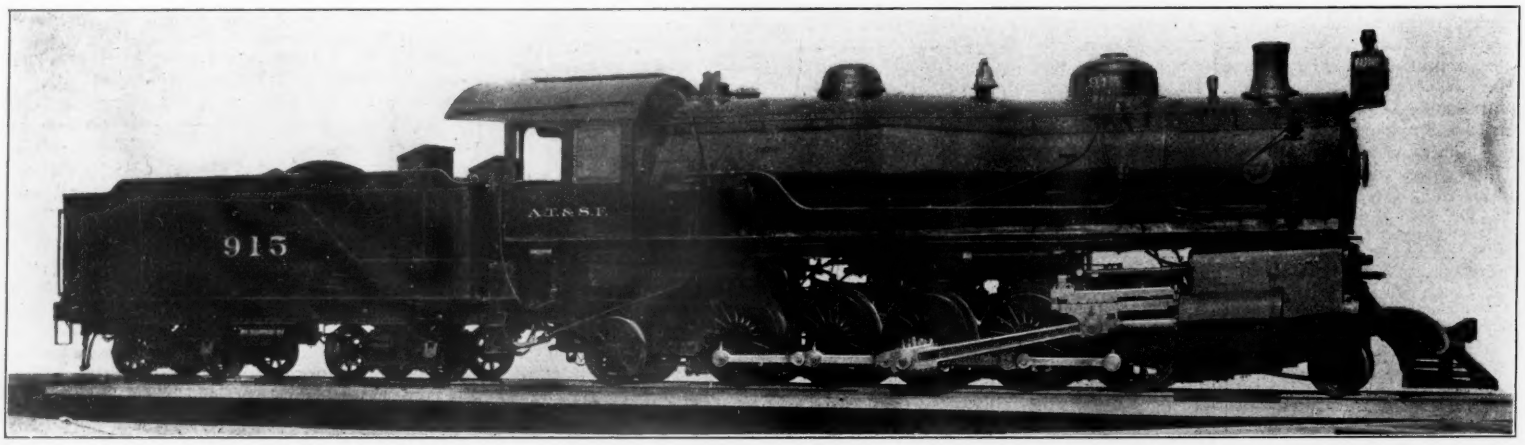
Length	108 in.
Width	78 in.
Depth, front	80¼ in.
Depth, back	78¼ in.
Material	Steel
Thickness of sheets	⅞ in. and 15/16 in.
Water space	Front, 4½ in.; sides, 5 in.; back, 4 in.

Tubes.

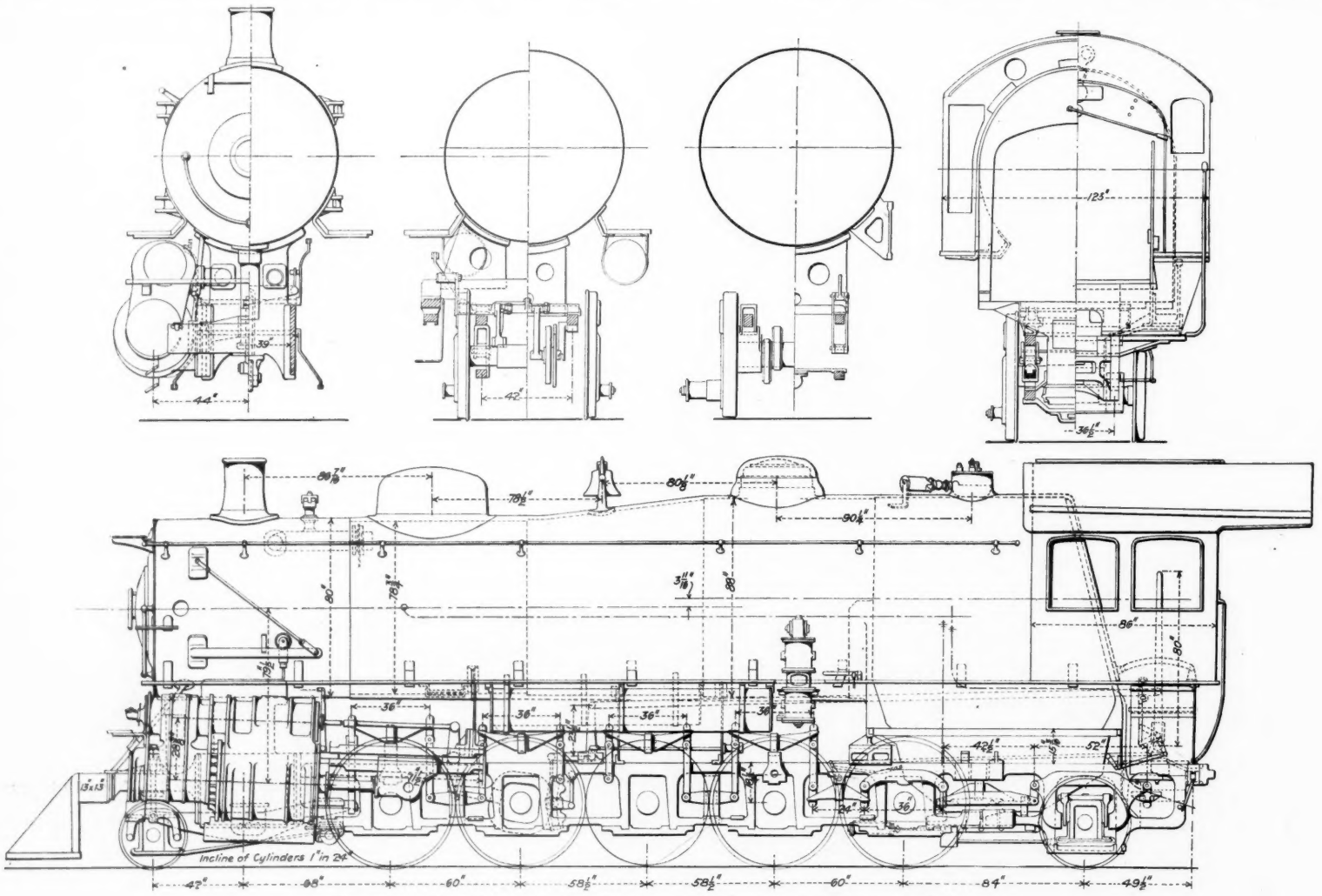
Number	391
Diameter	2¼
Length	20 ft.

Tender.

Type	8-wheel
Wheels, diameter	34⅛ in.
Journals	5½ in. x 10 in.



Tandem-Compound "Santa Fe" (2-10-2) Type Locomotive for the A. T. & S. F. R. R.



Elevation and Sections of Tandem-Compound "Santa Fe" Type Locomotive.

*See *Railroad Gazette*, June 19, 1903, p. 441, for steaming capacity formula for compound locomotives.

Improvements in Electric Track Welding.*

During the past year a number of improvements have been made in electrical track welding which, in view of the costly extension of railroad lines contemplated and the relaying of old tracks with new rails, are of the utmost importance. By the old method of track welding the number of breakages of rails was quite formidable in the course of a year; but with the modern improved electric welding system not one in a thousand of the

*Extract from an article by George E. Walsh, in the *Electrical Review*.

joints shows breakage or loosening. The only weakness in the modern system was found at the bolt or bond-holes beyond the bars, and this has been remedied now by making the weld longer to cover the holes. The result of this has been that continuous rail joints are made which are as strong as the rail itself in any other part of its entire length.

The first step in the process is to remove all dust, grit, grease and rust from the joints by means of the sand blast. The trolley car which carries the welder has also a strong sand blast, which is operated by the motor. The blast is driven by an air compressor, which receives its power from a storage tank mounted on the car. The electric motor operates the compressor, and fills the storage tank. There is a good size sand bin and a mixer operated by electric power, and when in use the blast of air carries the fine sand against the surface of the rail joints under continuous pressure. The cleansing of the joints by the sand blast, whether they are new ones or old ones being repaired, must be carefully attended to, for in the early welding processes less attention was given to this part of the work, and the joints were always breaking. A hose and nozzle carry the blast of sand to the rails and quickly remove all foreign substances.

When the rails are cleaned they are brought up to a perfect level by measurement, so that the joint will prove continuous and perfect. The rails beforehand are supposed to be made perfectly level on the graded street. The welding machinery is carried forward of the car on a crane which enables the jaws to move far enough out to grip the rails firmly. The crane is wide enough to suspend double jaws so that the welding can proceed on the two rails at the same time. The operation of the crane, which controls the jaws of the welder, is worked from inside of the car by means of a shaft and friction clutches. The shaft of this crane is run continuously during the process of welding by a 5 h.p. motor.

During the process of welding the transformer and faces of the rails must be kept cool, and a circulation of water kept up over them by means of a small rotary pump which is operated by the same motor. Ingenious devices have been made to cool this water as rapidly as possible after it has come in contact with the hot rails. It passes from the hot rails to an outer portion of the tank, which winds around to a false bottom through which air is forced by powerful blowers. This forced air tends to cool the water rapidly as it passes around the tank, and by the time it reaches the tank again it is almost as cool as in the first place. It can then be used over again, and passes through the old process of heating and cooling.

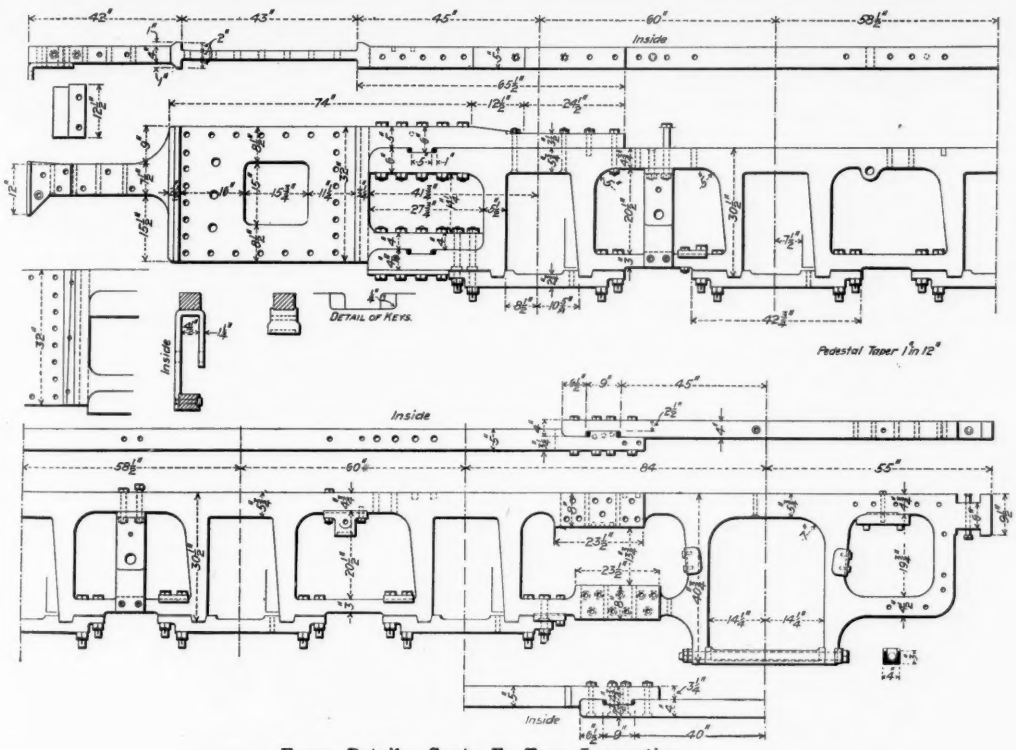
When the rails to be joined are gripped into the jaws of the transformer, the flat-rolled steel bars are put in position. These bars of steel have at either end, slight projections which are to connect with the web of the rail. When the bars are in position across the joint, the jaws of the welder are swung into position and made to grip them firmly. This process is quickly done, for the bars of steel are fitted beforehand, and a workman can soon place them where needed. The current is then turned on, and it flows through the bars to the rail web.

The welding is done by an alternating-current transformer, with primary windings of two coils in parallel, of 40 turns each. The jaws are held in position on either side by large levers, and a hydraulic jack connects these levers together about two-thirds of the way up. The necessary pressure is obtained in this way to draw the rails together and force the bars of steel firmly against the rails. This pressure can be regulated from a few tons to 35 tons and more.

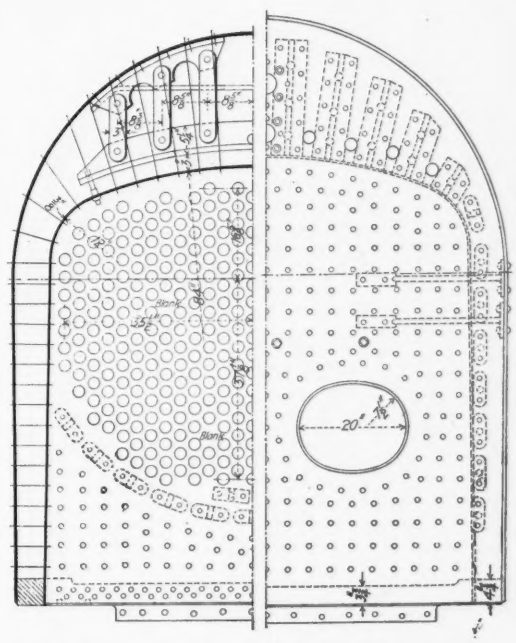
It has been found that the welding of the joints is increased by alternating the pressure, and it is a prime necessity that this change in the power of the jaws shall be regulated easily. The pressure is alternated frequently by the operator until finally it is brought up to the welding point when the union is made complete. At this critical moment the current is cut off and the full welding pressure put on the rails. The pressure is held until the heat of the rails has been greatly reduced. This final pressure at the welding point requires careful manipulation, for if the operator does not understand the relative importance of great pressure and great heat applied at the critical moment the joint will not prove a good one. The strength of the weld has been found to be increased very materially by holding the pressure for an indefinite time. The ends of the joint require this heavy pressure, after the weld, more than the center, and the jaws are made to bring the weight on the ends. When the bars of steel are in an expanded condition the ends should be welded, and consequently the improved method makes the center weld first, and then without stopping to let it cool under pressure the ends are quickly welded. As a result of this method the greatest elongation of the bars is obtained, and as they cool off and shrink the joints are pulled closely together. The result is a tight and strong joint. Good workmen can, in fact, make a joint that shows no opening at all, and the rail appears, to all practical purposes, one continuous, unbroken length.

When the rails are thus joined in a tight weld they are as strong as the ordinary rail, and it requires a good deal of a strain to weaken the joints. The grinding off of the heads to make the surface perfectly smooth and continuous completes the process. The grinder is generally made of an emery wheel mounted on a carriage and separate from the trolley car. It receives its power from the motor on the trolley, however, by means of a swing frame.

It requires from two to three minutes to complete a weld, or rather the current is turned on for that length of time to complete the most important stage of the process. In this time 225 amperes at 500 volts are consumed. The total current used in the operating plant is from 20,000 to 30,000 amperes, but the regulating apparatus maintains a constant voltage of about 300 regardless of everything else.



Frame Details—Santa Fe Type Locomotive.



Boiler Back Head and Section Through Fire-Box.

Foreign Railroad Notes.

The 1,600 men employed on the long Karawanken Tunnel in the Austrian Alps struck at the end of August for 8-hour shifts.

The Belgian State Railroads are ordering rails 18 metres (59 ft.) long. A few 24 metres (78¾ ft.) have been rolled for bridges.

The French note the construction of the first 50-ton (110,000 lb.) coal car in France. It is 37 ft. long and weighs 33,000 lbs. One coal company has ordered 50 such cars, and orders for others have come from railroad companies.

The Austrian State Railroads have contracted for a small quantity of rails weighing 88 lbs. per yard, while the heaviest heretofore used weigh but 72 lbs. per yard. About five miles of track will be laid with these rails now; but it is thought that it will become the standard section for lines with heavy traffic in Austria.

The Johannesburg Chamber of Commerce has petitioned the Governor to postpone the construction of a new railroad—an event which perhaps never happened before in a new country. The reason is that the railroad employs so many men that the miners are compelled to restrict their operations or close entirely. The Governor declined.

A gate-keeper on the Paris Metropolitan by error punched a ticket twice—which made it void. At every station the conductor demanded fare, and whenever the train stopped some station officer asked in a loud voice: "Where is the passenger with the bad ticket?" The holder sued the company for the injury to his feelings and recovered 100 francs, and the thanks of the magistrate to boot.

The Belgian Minister of Railroads has directed that the charges against subordinates made by their superior officers, in consequence of which these employees may be punished, hereafter shall be imparted to the men complained of, who are to acknowledge the receipt by their signature, and may submit therewith anything they may have to say in their defence. It has long been one of the grievances of Belgian employees that the charges against them were kept secret, so that they had no opportunity for defence and no protection against the prejudice or ill will of superiors.

The Austrian State Railroads at the end of 1902 worked 7,355 miles of railroad, an increase of 229 miles during the year. A large part of this mileage was not the property of the State, but worked by it on contract for its owners. The work done by the State Railroad management was a train-mileage equivalent to 7.83 trains each way daily, about three-fifths of which was of passenger trains. The gross earnings were at the rate of $9,320 per mile, about 26 per cent. of which was from passengers. This was 2 per cent. more than in 1901. The working expenses were 64¼ per cent. of the gross earnings. The net earnings of the lines owned by the State amounted to 2.27 per cent. on their cost, against 2.15 in 1901.

The indications are general (except perhaps in Russia) of a recovery from the industrial paralysis on the continent of Europe which began generally in 1900. "Paralysis" is an exaggeration; but the growth, which had been rapid for some years, ceased suddenly then, and many of the leading industries became unprofitable, and railroad earnings decreased, much more than working expenses. Earnings have been increasing moderately for several months, and especially significant is a large increase of coal shipments in Prussia.

We have all heard of the reverence of the Chinese for the graves of their ancestors, and of the obstacles these present to railroad construction. The Chinese are unwilling to bury any one in an old grave, and as the country is very old, there are many times as many graves as inhabitants, though the living people are not a little crowded. But it is a mistake to suppose that the living are unwilling to have the bones of their fathers moved. If necessary they will put them in a new grave; but they charge a pretty sum for the violence to their feelings as well as for their trouble and expense. Where a railroad is under construction, much of this work is done by professional undertakers, who negotiate between the railroad company and those to whom the graves belong. They have an eye to the main chance, as was shown on the line from Hankow to Pekin, where one day a section was staked out for the graders which happened not to cross a single grave. The next morning, however, four fresh grave mounds were found on the line, and undertakers ready to remove the corpses—coffins at least—at the usual rates.

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

CONTRIBUTIONS.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.*

Further explanation of the enormous difference in the prices bid for structural steel delivered and for steel erected (which was discussed in this column last week) is afforded by the following incidents: The American Bridge Company is erecting a huge steel structure near New York City. The riveting is done by members of the Sam Parks faction of the Housesmiths' and Bridgemen's Union. These men get $5 a day, and in the riveting gang of two journeymen and a boy the union rule requires full payment to the boy. It is not presumed that the boy is allowed to keep all of his $5, for the walking delegate must live. The union rules limit the gang to 100 rivets a day, although they are furnished with pneumatic riveters and it is easy to set 125 rivets a day. The labor cost of the riveting on this structure is therefore, normally, 15 cents per rivet, but practically this is considerably increased by time lost in frequent disputes, and in interfering with their neighbors' business. Within a few hundred yards of this structure another contractor is erecting a steel building and is employing members of the anti-Parks faction of the same union. It is difficult to compute the cost of this contractor's riveting, because, although much is paid for, little is done. The near-by Parks men frequently take a few hours off and drive the antis from their work. On another job in New York City, quite comparable in all respects, the journeymen non-union riveters get $2.50 a day, but they get this pay every working day, all the year round, so that their yearly earnings probably exceed those of the union men, and they have no dues or assessments or walking delegates to support. The riveting gang consists of two men and a boy, costing $6.25 a day. They average 125 rivets at a unit cost of 5 cents each for labor.

The friction draft gear has now been in actual service about seven years, long enough to determine its saving in car repairs, which is the measure of its efficiency. Beyond question it has protected the cars equipped with it and done much to save cars in the same train equipped with spring gears. There are only one or two roads where the majority of the cars have friction gears, and from which definite figures may be obtained showing the cost of repairs to draft gear when the friction gears work to their maximum efficiency, one behind the other in a long train. Such figures have from time to time been given out, always showing a practically negligible cost, but railroad officers have not been willing to accept as altogether convincing the results attained on one or even two or three roads. They have had, and still have, doubts as to the life of the friction gear and its efficiency after long use; for where there is constant friction there must of necessity be wear, and wear means an increase in travel and loss of efficiency. The makers of one friction gear recently desired to see for themselves the amount of wear on the friction surfaces of their gear. A gear was removed from a car on which it had been placed 15 months before—a 100,000-lbs. capacity hopper coal car, which had been in regular service in heavy trains on a mountain road. It was probably as severe service as any car gets. Nothing had been spent on the draft gear or attachments for repairs or renewals. An examination of the friction surfaces showed that after 15 months, the sand marks had not been entirely worn off of the cast-iron wedge blocks while at the same time there was positive evidence from the polished high spots on all the surfaces, that all the parts had been working continuously over one another and under great pressure. There were further evidences that the capacity of the gear had been exceeded, but never to an unsafe amount, showing that it had received severe blows but had dissipated by far the greater part of the shock. There was no appreciable increase in travel or lost motion from the slight wear which had taken place, and altogether the gear seemed to be in better working condition than when first applied. The result of the inspection met the most sanguine expectations of the makers. It set at rest any doubts of the life of the friction surfaces, not only in this particular form of gear, but in others as well. If, in this length of time, soft cast-iron will wear only enough to polish the high spots on the necessarily imperfect surfaces, it is reasonable to suppose that the wear in the whole gear and the resulting lost motion will never be a serious obstacle. Had this been a laboratory test in a testing machine under conditions never approached in service, the results of continued sliding of one surface over another might well have been doubted and the question of wear left still unanswered. Time and actual service alone settle such questions as this. For this particular case, at least, the results obtained in service remove any doubts as to the life of the friction gear.

The Diversion of Grain From Atlantic Ports.

In a recent summary of the arguments in favor of building the New York State Barge Canal, published by the state committee which advocates the project, the position is taken that

"the railroads, spreading in every direction, have removed from New York her unique position of supremacy, and have seized upon the apathy of the people in regard to keeping its canal property up to date to so discriminate in the making of rates that our commercial rivals are to-day in a better position to get the freight from the lakes than this city, which still possesses the strategic position, but does not occupy it. As a result New York has been for years steadily losing its commerce, and alone of all of the Atlantic ports is falling behind. At one period our commerce was 75 per cent. of the whole nation's. It has now fallen to $36,000,000, less than one-half, while other ports have grown in proportion. In certain commodities it has fallen behind Philadelphia and Baltimore, and Montreal has been steadily forging ahead."

The arguments here advanced have been used widely in the campaign. The fallacy contained is particularly harmful in the formation of right judgment, because it is based on conditions which are obvious enough to any observer, but seem singularly susceptible of misinterpretation. It is true that much traffic has been diverted from New York because of the development of other ports, and that the commerce of New York, formerly 75 per cent. of that of the whole nation, is now less than one-half. But that is an eminently healthful state of affairs, and shows a condition of national prosperity which was certainly to have been expected, in connection with the gains in agriculture, manufacturing, and transportation. It might well be asked what the southwest had been doing all these years, if New York were the best outlet for Kansas wheat.

It seems almost childish to point out that the business done by one port would have to increase in an enormous ratio to mantain a given percentage of the total; especially in a young country. A man 35 years old may be three times, or 10 times as old as the combined ages of his children, but the same ratio will not hold when he is seventy. Yet this inevitable arithmetical relation is quite similar to the implied reproach in the argument, quoted above, that New York's 75 per cent. has fallen to less than fifty. What the Canal Committee evidently mean is that Galveston, Baltimore, Philadelphia, and especially Montreal, are receiving a large amount of grain which would be welcome at New York, and which New York wishes greatly to secure. Seeing no other head to hit, the committee directs its attack against the railroads.

If the railroads of the United States had been built from all the traffic centers of the country to New York, and to no other port, doubtless they would have upheld the "commercial supremacy" of that city, and it is true that so far as they have provided outlets elsewhere, they have tended to lessen that condition. If this be treason, it is hoped the Canal Committee will make the most of it; but it is possible that they may not care to define their position so clearly. It is probable that the general contention that New York should get more grain is really the summum bonum of their case. Of course, they will not say that they want it all.

If the suggested remedy—the enlarged canal—be applied, it is presumable that traffic is anticipated primarily from those of the grain States which are northerly, rather than southerly, in position. Galveston and New Orleans are located so advantageously as export points for the Kansas region that it is idle to suppose any considerable amount of grain raised in the southwest would find its way to Buffalo. There remains, then, the territory located within striking distance of the Great Lakes, and here the Barge Canal encounters at once a formidable adversary in the Canadian route. Grain originating in the northwest can be brought readily to one of the Georgian Bay ports, for transfer to the Canadian Pacific, Grand Trunk, or Canada Atlantic railroads, or it can be put in a barge and carried by water to Montreal, by way of the Canadian canals and the St. Lawrence. The distance from the northwestern grain district to Montreal is considerably less than that to New York; and the proportion of the route which consists of canals is very much less. The maximum capacity of the American canal boat, in accordance with the $101,000,000 project, will be about 800 tons; that of the Canadian canal boat is already more than twice as great. So a small boat is expected to compete with a large one, and a long, shallow canal with one deeper and much shorter.

The ability of the railroads to haul grain cheaper than can be done in a 1,000-ton barge canal has been touched upon in previous articles, and will be taken up again. It is sufficient, for the present, to note that the Canada Atlantic hauls grain to Montreal all summer, in competition with 2,200-ton, instead of 1,000-ton barges.

The manifest conclusions seem to be that the Canadian grain routes are quite able to protect themselves against the competition of the proposed barge canal; the southwestern grain can in no wise be diverted from the southwestern ports; and there seems to be no reason to suppose that the railroads supplying Baltimore and Philadelphia cannot cut under any reduction which the canal might theoretically make in the grain rate to New York. It by no means follows that a low rate to a given point brings increased business, unless that rate is occasioned by an actual reduction in the cost of transportation, so fundamental that rival ports cannot compete.

It is frequently overlooked in the discussion of grain rates, that the charge for hauling a bushel of export grain from the interior to the seaboard is merely a portion of the total rate to Liverpool, or other foreign port to which the grain is consigned. As with through traffic everywhere, there is a tendency for rates by different routes to equalize themselves, and even though New York steamship men make a better bargain than Baltimore steamship men, the ultimate cost to the shipper will work out about the same, and, in the long run, time and convenience will tend to determine which of these ports of shipment will be chosen, rather than difference in rate. The following table per bushel of wheat shows how quickly ocean rates met rail rates during the railroad war in 1876:

		Chicago to New York.	Ocean rate.	Total cost to shipper.
April	6	24c	10c	34c
	13	21c	9c	30c
	20	15	9½@10	24½ +
	27	12	13½	25½
May	4	12	17@18	29 +
	11	12	17@18	29 +
	18	12	19@20	31 +
	25	12	15@16	27 +
June	1	12	20@21	32 +
	8	12	20@21	32 +

Taking into consideration the normal fluctuation in ocean rates at that time, the table of resultant cost to the shipper shows how the great cut in railroad rates was equalized. There was a gain to the ship owner and a loss to the railroad, but the cost of transportation from the northwest to Liverpool was only slightly affected.

It seems evident, therefore, that the proposed barge canal is inadequate to accomplish the changes promised in the business of New York. A ship canal, could it be created by vote of the State Legislature or proclamation of the Governor, would doubtless effect a permanent reduction in the cost of transportation, the only real moving element in the attempt to artificially direct traffic. But the interest on the cost of such a deep waterway, if it were dug, not proclaimed, would doubtless far overbalance the money it would bring in, and turn a permanent reduction to a substantial increase in the cost of trans-

portation. Where a ship canal would do the work of a man at the wage of a giant, the barge canal is projected to do the work of a boy, at the wage of a man.

Hungarian Railroads—Ten-Year Comparison.

The Hungarian Minister of Commerce has issued a report on the railroads of the country in 1901, in which some comparisons are made with the results in 1891. From this it appears that the total length of railroad worked, was just 11,000 miles in 1901, against 7,569 in 1891, an increase of 45 per cent. The length of the State Railroads had increased only from 4,655 to 4,863 miles; and the growth was chiefly in light local railroads, which have become nearly half of the whole system and have increased 155 per cent. since 1891.

The stock of locomotives increased from 1,765 to 3,000, and on the State Railroads alone from 1,407 to 2,478, which also had an increase nearly 80 per cent. in passenger cars and 65 per cent. in freight cars.

The passenger traffic on the State Railroads, which is 70 per cent. of the whole, increased 38 per cent. in the 10 years and the freight traffic nearly 40 per cent. The zone tariff was introduced a few years earlier than 1891, and its chief effect had been produced already. The traffic in 1901 was at the rate of 299 passengers and 680 tons of freight each way daily. For a country like Hungary, with 1,745 inhabitants per mile of railroad, this is a light traffic, and especially a light passenger traffic. In spite of the extremely low rates, especially for considerable distances, the average amount of travel per inhabitant of Hungary in 1901 was only 79 miles; and the average freight movement per inhabitant was 202 ton-miles. In this country there were 191 passenger miles and 1,621 ton-miles per inhabitant in 1900.

The passenger traffic on the local railroads, which exceed the State Railroads in length, is at the rate of 77 each way daily, and their freight traffic is but one-tenth that of the State Railroads. The cost per mile of the State Railroads has increased 20 per cent. since 1891, and amounts now to $77,067. The local railroads have cost about $24,000 per mile, and the other company railroads, ranked as heavy lines, about $71,000. There are but 834 miles of the latter.

The gross earnings of the State Railroads increased 44½ per cent. from 1891 to 1901; their working expenses 65 per cent., and their net earnings only 20 per cent. The company main lines (with no change in mileage) had a greater increase in expenses than in earnings. The local railroads, which increased so greatly in mileage, very slightly increased their gross earnings per mile (just 1 per cent.), and more largely their net earnings per mile (nearly 6 per cent.). On the State Railroads the earnings were $8,088 gross and $3,110 net per mile. The company main lines earned $8,250 gross and $3,125 net, and the local roads only $1,535 gross and $668 net per mile.

The average rates on the State Railroads were 0.896 cent per passenger-mile and 1.237 cents per ton-mile, which are slightly higher than the averages in 1891. The average rates on the company main lines were nearly the same as on the State Railroads in 1901 (slightly lower), but they were considerably higher in 1891. On the local roads the average passenger rate in 1901 was very little higher than on the State Railroads, but the freight rate was nearly one-half higher.

The State Railroads yielded 3.48 per cent. on the capital represented by them, which, as the obligations were largely issued at a discount, is 4.17 per cent. on the cash cost of the roads. In 1891 the return was 3.72 per cent. The local roads earned 2.9 per cent. on their nominal capital.

Illinois Central.

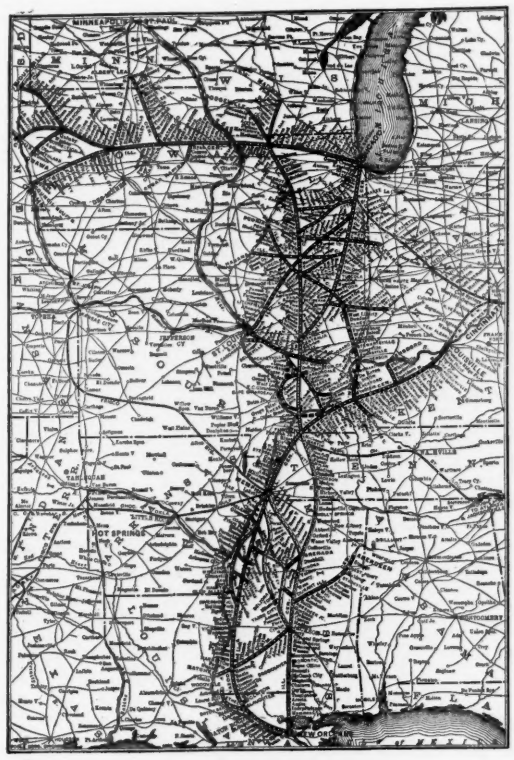
A number of articles have been printed recently in the *Railroad Gazette* descriptive of the important betterment work which has been done through a series of years on the Illinois Central and the Yazoo & Mississippi Valley Railroads. The operations during the year ending June 30, 1903, have especial interest when they are thus regarded as a link in the rebuilding of a great system, and the gains in density of traffic and in the efficiency with which the increased traffic has been handled may be considered the summing up, or moral, of the efforts to harmonize and develop the property. In order to bring out this point more sharply, many of the operating statistics are compared through a period of several years. Comparisons of traffic density for the years 1903 and 1902 are rendered more than ordinarily useful because of the slight changes in mileage, only 17 miles having been added to the average for 1902.

Gross receipts from traffic for the current year amounted to $45,186,077, as against $40,821,030 in 1902. Operating expenses, which were $29,835,883, increased over 3½ millions; taxes were somewhat greater than last year, and the income from miscellaneous investments somewhat less, but a considerable saving was effected in fixed charges and rentals, so that net income was nearly a million dollars greater than in 1902, amounting to $10,729,393, in addition to a surplus dividend fund of $1,132,447 brought forward from 1902. Dividends at the rate of 6 per cent. were paid on the capital stock, these payments aggregating $5,702,400, and in addition, nearly five million was appropriated for betterments, and $1,178,187 was carried forward as the surplus dividend fund for next year. The amounts appropriated out of earnings for extraordinary betterments since 1897 are shown in the following table, in connection with the resultant growth of gross and of net earnings per mile of road:

Year.	Approp. for betterments.	Gross earnings per mile.	Net per mile.
1897	$150,000	$7,064	$2,373
1898	829,000	7,237	2,637
1899	1,475,040	7,659	2,700
1900	2,416,674	8,481	2,921
1901	2,895,400	8,755	3,001
1902	4,340,172	9,546	3,408
1903	4,881,253	10,525	3,575

Thus it is shown that nearly 17 million has been appropriated for betterments in the last seven years, exclusive of the annual maintenance charge.

For carrying on this work of permanent improvement, $10,300,645 was charged to capital during the past year, as against $3,489,062 in 1902, and continuously large charges in the years preceding. The general progress which has been made in this betterment work is such that it is reasonable to expect a considerable falling off in extraordinary expenditures, within the next few years. Several items in the full statistics shown in the report indicate quite directly the present condition of the system. The average weight of all rails in main track, for example, now stands at 71.96 lbs. per yd., as compared with 70.56 lbs. last year, and 65.43 lbs. in 1897. The average tonnage capacity of revenue freight cars is 32.87,



Illinois Central.

as against 30.86 in 1902, and 24.42 in 1897, and revenue train load has increased during the period as follows:

Year.	Train-load.	Year.	Train-load.
1897	193.5	1901	235.2
1898	206.2	1902	274.7
1899	209.4	1903	288.2
1900	221.8		

In view of the large amounts of high class and of perishable freight carried, the present train load is as large as could be expected, and the continuous gain during the seven years shows the increase in operating efficiency.

The Illinois Central makes use of another compilation to show progress, in its "units of service rendered" table. Passenger miles are added to ton-miles, and it is interesting to see that the road performed over 7.78 million *more* of these units of service in 1903 than in 1902, on a mileage practically unchanged. The aggregate passenger and freight units in 1903 were 4.68, as many as in 1889, and the "service rendered" per mile of road was nearly three times as great.

In order to simplify the organization by reducing the number of subsidiary corporations, propositions for the acquisition of four railroads now building or operated under lease, and for a portion of two other similar properties, will be submitted at a special shareholders' meeting, Nov. 14. The aggregate length of these roads is 173 miles, exclusive of 40 miles owned already, and their purchase will involve no additional outlay, since the cost of all of their stocks and bonds issued has already been included in the accounts of the company. The purchases will make it possible to subject nearly all of these railroads to the lien of a mortgage to secure Illinois Central bonds, which, when issued, will become available assets in the treasury.

Rolling stock has been increased during the year by the purchase of 63 locomotives, of which all but seven constitute additions to equipment; 11,102 freight cars, of which 9,666 were added to equipment, and 27 new coaches. The average tractive capacity of the locomotives, on level track, is now 3,573 tons, as against 3,448, last year, and the total number in service, as shown by the inventory, is 1,003. The total number of freight cars reported is 51,911 (of which 232 numbers are at present vacant), so it appears that the additions during the year amounted to considerably more than a fifth of the entire amount. Air-brakes are now attached to 84.77 per cent. of the freight car equipment.

The following table summarizes certain details of operation. It is especially worthy of attention that the charge for maintenance of way, in spite of the diversity of the lines, has not been less than $1,125 per mile in any year since 1897:

	1903.	1902.	1897.
Average mileage	4,293	4,276	3,130
Freight earnings	$30,592,094	$27,710,782	$15,162,019
Passenger earnings	8,977,228	8,020,648	4,214,461
Gross earnings	45,186,077	40,821,030	22,110,937
Conduct. transportation	16,676,332	14,442,267	7,875,422
Maintenance of way	5,909,196	5,649,643	3,594,050
Maintenance of equip.	6,274,587	5,309,786	2,712,978
Maint. of way, per mile	1,376	1,321	1,148
Total expenses	29,835,883	26,248,123	14,683,944
Fixed charges	6,219,876	6,568,034	5,760,698
Net income	10,729,393	9,790,462	3,699,462

Yazoo & Mississippi Valley.

In common with the practice of the last few years, the operations of this company are not included in the main report of the Illinois Central. Many of the statements made regarding the parent company are also true of the subsidiary road, which forms a portion of the through route from Chicago to New Orleans, in addition to its feeder and branch line business. But the Yazoo & Mississippi Valley, although spending about as much per mile for maintenance of way as the Illinois Central, during the past year, is less advantageously situated regarding earnings. An adverse decision on back taxes in Mississippi has also occasioned an abnormal expenditure on that account, which has been paid from surplus income as a prior lien to the interest on the Second Mortgage Bonds, as made possible by the terms of the mortgage.

Gross earnings, however, increased from $6,587,356, in 1902, to $7,330,085, but the surplus, which amounted to $560,607, is smaller than for any year since 1896, and it does not include the payment of interest on either the Second Mortgage Bonds or the Land Grant Income Bonds of the Louisville, New Orleans & Texas, of which $9,104,000 and $10,000,000 are respectively outstanding. The character of these obligations, assumed with control of the property in 1892, is such that neither is listed as an "absolutely fixed charge." The flood damage, described and illustrated in a previous issue, accounted for $148,000 of the large increase in maintenance, and the increased cost of fuel, materials, and service is reflected in an increase of $356,292 in the cost of conducting transportation.

The following table is of especial interest as showing the amount of current taxation to which the road is subjected, exclusive of the back taxes referred to above:

	1903.	1902.
Average mileage	1,162	1,095
Gross earnings	$7,330,085	$6,587,356
Operating expenses	5,370,207	4,422,674
Taxes	302,953	282,262
Net earnings (taxes deducted)	1,656,925	1,882,419
Fixed charges	1,136,110	1,064,417
Surplus	560,607	865,754

Hocking Valley.

The report of this company for the fiscal year ending June 30 is the fourth issued since it was taken out of bankruptcy in 1899. The report shows that the property has earned $1,804,098 net, as a result of the year's operation. Out of this 4 per cent. dividends on the preferred stock amounting to $560,000, and 3 per cent. dividends of $321,324 on the common shares were paid. A large surplus was therefore carried over to profit and loss, and the total credit balance amounts to $3,230,300.

Gross earnings were $6,049,698, an increase of $733,175. Operating expenses were $3,838,526, an increase of $609,194, leaving an increase in net earnings of $123,980. The large increase in operating expenses was due to extraordinary expenditure of $354,544 charged to operation. Of this amount $167,136 was for new equipment, and $187,408 was for rebuilding freight cars. An extra charge of $94,690 was also made for rail renewals amounting to 3,152 tons, and for minor improvements.

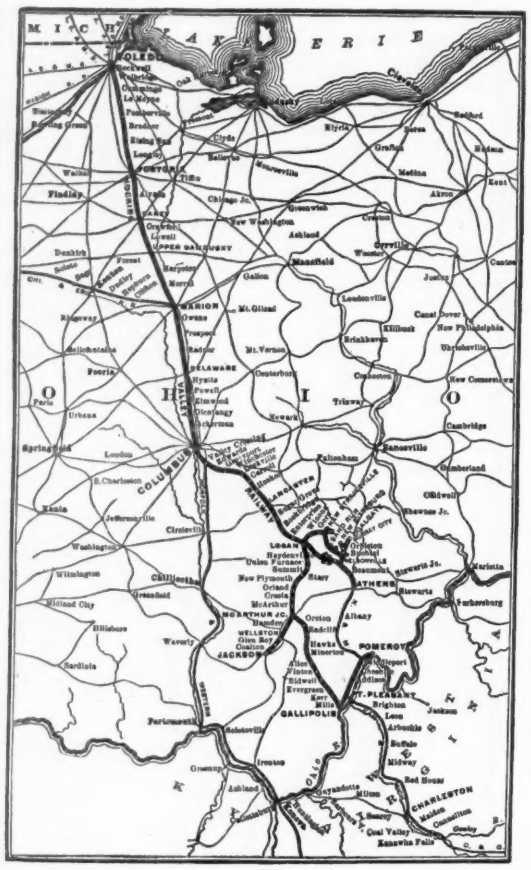
The capital stock was increased during the year by $1,000,000 of preferred and $578,400 common stock, and the proceeds were set aside for acquiring properties and securities as provided for in the reorganization plan of 1899. In addition, $920,000 first consolidated 4½ per cent. mortgage bonds were sold to reimburse the company for expenditures in redeeming car trust bonds and for the purchase of underlying securities. At the close of the year there still remained in the treasury an unexpended balance of $479,252 from the proceeds of these bonds. Car trust bonds amounting to $226,000 were retired according to the sinking fund provision.

Traffic statistics show an increase in the number of ton-miles and also in the tonnage carried. As 62 per cent. of the company's total freight tonnage consists of coal, the ton-mile receipts are necessarily low. A slight improvement in the average occurred, however, in the last year, the rate being 4.51 mills, against 4.28 mills in 1902. This advance was presumably due in part to a slight increase in the amount of higher class freight carried during the past year. The efficiency with which traffic has been handled, so as to bring large earnings with a low ton-mile rate, is shown by the large average train-

loads which have prevailed for a number of years as shown by the following table:

	1899.	1900.	1901.	1902.	1903.
Average train-load.....	522	646	645	678	622

The decrease in average train-load for the past year



Hocking Valley.

is so marked as to need explanation. Assuming that coal is at all times carried in full train loads, the fluctuations in the movement of other commodities must have been extreme.

NEW PUBLICATIONS.

Swing Bridges. By "Loidis," London: The Railway Engineer, 1903. Cloth. Price 5 shillings.

This is the third of the railroad series of text books for railroad men, from the same publishers. It is a practical treatise on swing bridges and their design, intended for the convenience of the engineer. Much of the knowledge available on many engineering subjects is buried in the profound text books under masses of theory and irrelevant discussion, and this is particularly true of bridge design. Authors have treated the most complex cases and discussed at great length the exceptional designs of bridges and have lost sight of the needs of the every day engineer who is working on the simple problems. It is to meet this need in the case of swing bridge design that the author of this little book has collected in compact form all the calculations for three types of moderate span, railroad drawbridges. The loads are assumed from modern English practice and all of the necessary analyses made for each type. The book is a welcome addition to the practical literature of bridge engineering.

TRADE CATALOGUES.

The Peerless Rubber Manufacturing Company, New York, is sending out complimentary copies of Gardner D. Hiscox's "Compressed Air and Its Applications." The 822 pages of the volume proper have been considerably increased by numerous inserted pages printed in two colors, describing the numerous products of the Peerless Company. As is well known, this work by Hiscox is a valuable and comprehensive treatise on the production, uses and applications of compressed air. It gives consideration to the physical properties of air from a vacuum to a liquid state, its thermodynamics, compression, transmission and uses as a motive power. Although compressed air is the subject and the volume is so entitled, the author believes that if consideration were only given to the properties of air higher than atmospheric pressure it would be limiting the scope of the subject. The work therefore includes a consideration of the properties of air below atmospheric pressure. The first nine chapters of the book are mostly a theoretical treatment of air and its properties under different conditions, including its thermodynamics, and isothermal and adiabatic compression and expansion. Properly following this, in logical order of development, come the compressed-air indicator card, the work done in single and multi-stage compression, transmission of power by compressed air, reheating, and air motors and compressors. The application of compressed air to industrial purposes is shown by numerous illustrations of pneumatic appliances of different kinds. There are also chapters on air as applied to pyrometry, compressed air in railroad service and in warfare, the pneumatic system of tube transmission, refrigeration, the hygiene of compressed air, and the properties and uses of liquid air. The final chapter contains a list of all the patents issued on compressed air and its appliances from 1875 to July, 1901. The book contains 40 air tables and 545 illustrations.

Soft Water is an attractively designed pamphlet of the Railroad Department of the Kennicott Water Softener Company, Chicago, the purpose of which, as stated in the "Foreword," is to explain the most effective and economical method of transforming hard water into soft water and to show the saving resulting from softening and purifying water before use. The Kennicott system uses chiefly lime and soda ash as chemical reagents because of their efficiency and cheapness. The exact proportions and the cost of different reagents which will precipitate 1 lb. of carbonate of lime and 1 lb. of sulphate of lime are given, the cost of operation of a Kennicott softener being from 1 to 2 cents per 1,000 gals., for the general run of water. The book contains large half-tone engravings of Kennicott softeners being used by numerous railroads and industrial plants, and the internal construction and operation of the device are illustrated and explained.

Coal, Cinders and Freight is the latest book of The Link-Belt Companies, Philadelphia and Chicago, on their methods of coaling locomotives, disposing of cinders, and handling freight in depots and warehouses and at docks. The book is for distribution among railroad officers, and is most creditable in design and appearance. Numerous excellent half-tone engravings from photographs show large-capacity terminal and line coaling stations with ash-handling and sanding features. There are also views of separate ash-handling plants, of which quite a number have been built. Steamship loading plants, and carriers and conveyors of different kinds are shown in a variety of applications; also the Dodge coal storage system. The book is printed in two colors on heavy enamel paper and is bound in cloth.

St. Louis Expanded Metal Fireproofing Co., St. Louis, Mo., has had reprinted and bound as a small folder, an article on Tests of the Union Between Concrete and Steel, which appeared in the *Railroad Gazette*, Sept. 18, last. This is a report made by Prof. C. W. Spofford, of an elaborate series of tests to determine the holding strength of various forms of steel rods embedded in concrete, among which were several specimens of the Johnson corrugated bar. Johnson's formula for reinforced concrete steel beams with diagrams for graphical solution is reproduced in the folder also. The St. Louis company is the general agent for these bars.

Consolidated Car-Heating Co., Albany, N. Y., has issued Catalogue No. 6, dated 1903. It is a very handsome and complete book, covering all the apparatus and fittings which the company makes for heating cars by steam. The company furnishes either direct steam or driven hot water systems, both of which may be modified in detail to suit almost any arrangement of seats or piping. The principal parts of all the apparatus for both systems are illustrated and their operation described. Each piece is given a number for convenience in ordering.

Thomas C. Farrell, Washington, N. J., builder and contractor for monolithic concrete masonry, publishes a small pamphlet describing a patent plank holder for builders' molds, which he sells. The plank holders are made in all shapes for joining the retaining planks on flat surfaces and at all angles. They are easily and quickly removed when the concrete has set and may be used any number of times on the same or different jobs. The planks are securely held in place and there are no snaps or catches to break or get out of order.

The H. W. Johns-Manville Co. issue a humorous folder which tells, pictorially and literally, the story of bidding for U. S. Government contracts for half a million square feet of roofing paper for army buildings in the Philippines. It was a world-wide competition and the two contracts, covering the whole amount, were awarded to the H. W. Johns-Manville Co. The two orders were filled, respectively, within 10 days and 30 days of their receipt.

Standard Roller Bearing Co., Philadelphia, Pa., describes the principal forms of ball and roller bearings which it makes, in Catalogue No. 10, just issued. The company is prepared to make ball or roller bearings for almost any purpose where babbitted bearings are now in use. A propeller roller thrust bearing is one of its specialties as well as a design for a car journal bearing.

Broderick & Bascom Rope Company, St. Louis, has issued a 51 page vest pocket catalogue giving information on the strength and use of wire rope. The catalogue also contains illustrations and lists of the ropes, clips, shackles, turnbuckles, clamps, hooks, blocks, sheaves, etc., made by the company, together with the telegraphic code for ordering the various products.

The Goheen Mfg. Co., Canton, Ohio, has issued a catalogue descriptive of Galvanum, a durable paint for galvanized iron and steel surfaces. The pamphlet is illustrated with a number of engravings of buildings protected with this paint.

The Holland Company, Chicago, has issued circular No. 6, which includes price lists, descriptions and illustrations of the Dake pneumatic chain hoist and Dake square piston engine.

Walter D. Crosman, Chicago, has issued a pamphlet giving a list and description of "Army and Navy Liquid Glue."

The Value of an Injury.*

We all understand that compensation is both an underlying law of nature and also the law of the country in fixing the amount of damages, and it may be said that in fixing the value, cost or price of any injury, the law of compensation is the guiding star. The difficulty is to apply the rule of compensation to each individual case as it arises. Legal experts say that in actions for damages for personal injuries where physical suffering has resulted, and where mental distress has been a consequence of the defendant's act, there is no measure except the judgment of the jury; and the courts are very loath to interfere with a verdict in the absence of plain evidence that the jury have abused the discretion vested in them. The value or cost of all injuries must, in the nature of the case, be extremely relative. The loss of the eyes would not mean the same in dollars and cents, at least, to the day laborer and the accomplished surgeon. The loss of life, itself, would not mean the same in dollars and cents to the family of a young, vigorous man who gave promise of many years to live, and of a man earning the same salary whose age and infirmity was such as to render it certain that his labors were almost at an end.

In the case of Morgan vs. Southern Pacific, decided by the Supreme Court of California, the plaintiff was a woman and the injury was permanent and total, amounting practically to total disability, and the verdict, which was for $15,000, was sustained. In the case of Chicago vs. Leseth, decided by the Illinois Supreme Court, the plaintiff suffered from a displaced womb resulting in permanent injury to health. The verdict was for $15,000 and was sustained by the Court.

In the case of Bennet vs. New York Central, an $8,000 verdict, in a case of curvature of the spine, was sustained by the Supreme Court of New York; and in International vs. Mulliken, decided by the Supreme Court of Texas, $4,000 was held to be a reasonable verdict for "incurable spinal disease."

In the case of Osborne vs. Detroit, 32 Fed. Reporter, $10,000 was held to be a reasonable verdict for an injury resulting in paralysis of one-half the body; and in the case of Bishop vs. St. Paul City Ry. the Supreme Court of Minnesota held that $15,000 was reasonable for the same injury. The Supreme Court of Wisconsin held, in the case of McMahon vs. Eau Claire Water Works Co. that $5,000 was not an unreasonable verdict in case causing "paresis or progressive paralysis."

A very interesting case will be found in 86 Georgia, which is styled Georgia Pacific R. Co. vs. Dooley, in which a $16,000 verdict was upheld for an injury resulting in the "displacement and enlargement of the heart." The case of Dieffenbach vs. New York Central presents a case of a very severe injury, not necessarily permanent, and the plaintiff, who was a young man earning more than $4,000 a year, recovered a verdict of $25,000 which was allowed to stand.

There is a case recorded in 78 Fed. Reporter, where a $5,000 verdict was allowed to stand for an injury resulting in the "impairment of muscular sense, feeling, and partial loss of hearing." The total loss of vision was the result of an injury, for which suit was brought in the case of Stearns vs. Reidy, reported in 105 Illinois Reports, and a verdict of $9,000 was held to be reasonable. A $14,000 verdict was sustained in the case of Wallace vs. Vacuum Oil Company, decided by the Supreme Court of New York, in which the injury is described as "the loss of eye and other serious injuries." A verdict of $100 was sustained by the Supreme Court of New York for an injury described as "a black eye."

The loss of a leg was held to justify a verdict of $2,300 in the William Branfoot case, reported in 52 Federal Reports, and the loss of both legs was held to justify a $15,000 verdict by the courts of Arizona, a $13,000 verdict by the courts of Colorado, and a $25,000 verdict by the courts of Illinois. The loss of both legs to a common laborer, earning a dollar a day, would be a very different thing, when measured by dollars and cents to the loss of a leg by a civil engineer whose salary was $10,000 a year. The loss of a foot was held to justify a verdict of $9,000 by the Supreme Court of Georgia in the case of Keating; and a verdict of $11,000 by the Supreme Court of New York in the case of Jordan vs. New York Central, and in the case of Commerford vs. Atlantic Avenue R. R. Co. the Supreme Court of New York sustained a verdict of $8,500 for the loss of several toes.

In the case of Chipman vs. Union Pacific, reported in 12 Utah, the plaintiff was a female child who had lost her foot and the recovery was $10,500, and the verdict was sustained.

In the case of the loss of an arm, a $5,000 verdict was sustained in one case by the Courts of Arkansas, an

*Abstract of an address by Dr. L. Sexton, of New Orleans, La., District Surgeon of the Illinois Central and the Louisville & Nashville, and President of the American Academy of Railway Surgeons, delivered before the Academy, at Chicago, Oct. 1.

$8,000 verdict was sustained by the Supreme Court of Illinois, a $4,000 verdict by the Supreme Court of Iowa, and a $9,119 verdict was sustained by the Supreme Court of Texas in the case of Kirkland, while the Supreme Court of Wisconsin sustained a $10,000 verdict for the same injury in the case of Baltzer.

The loss of a hand has been variously estimated by approved verdicts ranging from $1,250 to $5,000 in cases reported by the various courts which I have had an opportunity to examine. The loss of fingers has been the prolific mother of many damage suits, and the verdicts have ranged all the way from a few hundred dollars to $8,500, which was the amount of the verdict in the case of Ridenhour vs. Kansas City Cable Ry., in which case all the fingers on one hand were disabled.

For injuries resulting in death verdicts show the greatest possible variation. . . . The railroad attorney would ordinarily prefer to defend a case of an injury resulting in death rather than one resulting in permanent disability; perhaps because a jury has more sympathy for a permanent cripple, who appears before them, than for the heirs or representatives of a dead man, whose injuries are covered by the grave. Like all other rules this one has its exceptions, and a pretty widow and orphan children, as plaintiffs, have frequently caused verdicts to rise very high when compared with the earnings of the "loved and lost."

The courts not only set aside verdicts which are excessive, but also such verdicts as may be inadequate. In the case of Phillips against an English railroad, reported in 29th Moak on page 177, a verdict of seven thousand pounds was recovered for "injuries sustained by the plaintiff, a physician, through the negligence of the defendant"; and it was set aside as inadequate on the ground that "the jury must have omitted to take into consideration some of the elements of damage." "The plaintiff, who was a physician in the prime of life, having a practice worth six or seven thousand pounds per annum, was reduced by the injury to a condition of powerless helplessness, with every enjoyment of life destroyed, and with the prospect of a speedy death."

. . . The railroad surgeon cannot prevent injuries, but he can very materially lessen the loss or damage incident thereto by careful, skilful, and painstaking attention to each case submitted to his individual care, and, in proportion as we lessen the cost of such injuries, will our services be valuable to the companies whose interests are committed to our care.

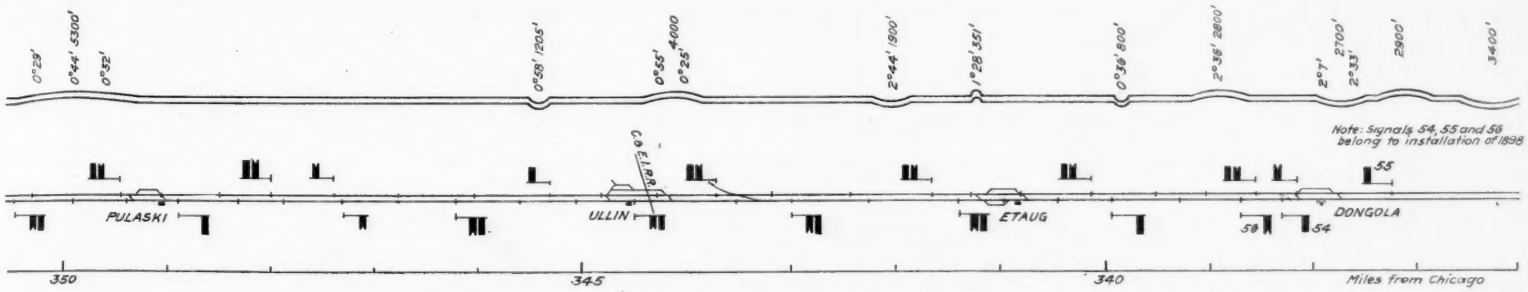
The Illinois Central Improvements—Signaling.

The Illinois Central has 364 miles of its track (about 156 miles of road) equipped with automatic block signals, and there are on its lines 88 interlocking plants. The number of automatic block signals is 487. Of the 487 signals, 142 are of the disk type, 169 of the electric motor semaphore type, and 176 of the electro-gas semaphore type. The first automatic signals used on the road were disks (Hall, enclosed), installed on the Chicago Terminal District in 1892. The electric semaphore signal is used from Kensington to Kankakee (installed in 1900), and from Bosky Dell, Ill., to Dongola, Ill., (installed in 1898). The electro-gas signal is used from Dongola, Ill., to Fulton, Ky., with the exception of the Cairo Bridge, where the disk signal is used.

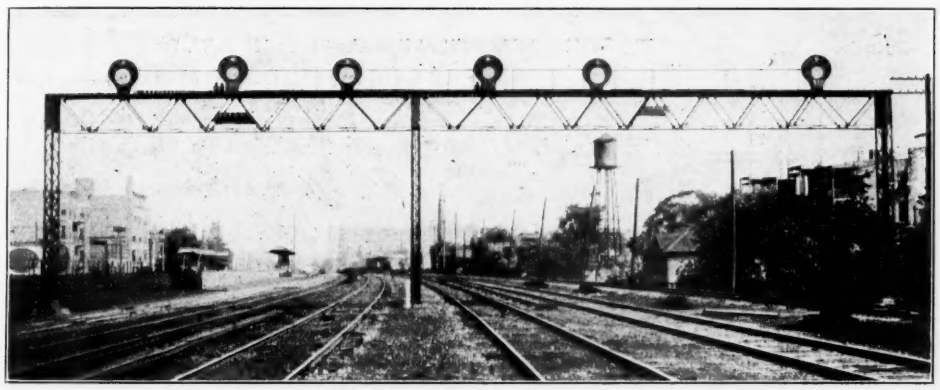
The installation of the electro-gas signals between Dongola, Ill., and Fulton, Ky., has just been completed, and they are giving excellent satisfaction. The records to date show one signal failure for each 18,645 signal operations. This is a better showing than has been made with either the electric semaphore or the disk. These figures for the electro-gas signal cover a period of two months, and there is reason to believe that a better showing will be made in the future, and it is expected that signals operated by carbonic acid gas will be more economical than electric motor operated signals. (The Hall electro-gas signal was described in the *Railroad Gazette* of June 5, page 386.) The simplicity of construction of the electro-gas signal is an attractive feature. On the Illinois Central the signals are installed on the normally danger plan, so that power is consumed only while an approaching train occupies the clearing section of track, which is usually about 3,000 ft. long. Where battery tubs (wells) are used they are of concrete, of the Monier construction. Iron relay and bell posts are used, so that the construction throughout is of a very permanent nature. Forty-inch Weber track joints are used where insulation is required. The rail joints are bonded, two wires being used, as is the customary practice. The signal circuits are broken through switch instruments on all facing point switches, but at trailing points a double shunt of the track circuit is employed, unless the signal circuit has to be extended beyond that switch for some other purpose. "Continuous light" spectacle castings are used, and the glasses are solid color roundels. The installation was made by the Hall Signal Company, its standard equipment being used throughout. The accompanying engraving shows a plan of the signal locations on a part of the line between Dongola and Cairo Junction.

In recent installations of automatic signals the long-time lamp font has been used. With careful attention these lights give satisfactory service. It has been found that one man can look after 120 signal lights in a district embracing 42 miles of double track.

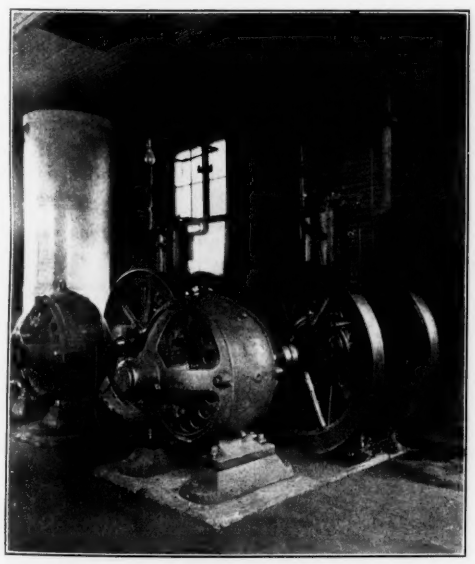
Of the 88 interlocking plants, one is of the electro-pneumatic type, made by the Union Switch & Signal Company; five are of the "all-electric" type, made by the Taylor Signal Company; and the remainder are simple mechanical plants. The latter have been put in by various signal companies. The more notable interlockings are at Clark street, 70th street and South Park avenue, Chicago; at Edgewood, Ill., and Laurette, Ill. The Taylor Plant at 16th and Clark streets, Chicago, has 128 levers. This plant went into operation June 16, 1891, and it was then the only large all-electric plant in use. The track layout is quite complicated. The construction of this plant cost $50,000. It requires an expenditure of approximately $2,700 a year for maintenance, and $4,800 a year for operation. The figures quoted for operation include all of the ordinary operating expenses and in addition the cost of the gasoline that is used by the gasoline engines which drive the generators. Electric lights are provided throughout, the current being taken directly from the generator. The power plant consists of duplicate 5 h.p. Fairbanks-Morse gasoline engines and 2½ k.w. direct connected generators. In the event of any difficulty with the engines or generators, the lights may be connected to a storage battery held in reserve. Experience has shown, however, that this is very seldom necessary. Traffic through this interlocking is heavy, usually over 700 trains a day. This involves approximately 7,000 lever operations daily. The power required to do this work is obtained from storage batteries kept in the lower story of the signal tower. Here are duplicate 150 ampere-hour Willard storage batteries. One of the batteries, when fully charged, will provide power to operate the signals, derails, and switches for a period of eight days. It will therefore be seen that the power for this purpose is obtained at a very small cost. (This interlocking was described in the *Railroad Gazette* July 12, 1901.)



Automatic Block Signals Between Dongola and Pulaski, Illinois.



Automatic Block Signals at Fifty-fourth Street, Chicago.



Power House for Signals at Sixteenth and Clark Streets, Chicago.

The interlocking plant at Stewart avenue and 21st street, Chicago (electro-pneumatic), was put into operation August 6, 1893. At this point the track layout is very complicated and the traffic is heavy; considerably over 1,000 trains a day passing through.

At 70th street, Chicago, is a large mechanical interlocking plant installed by the Johnson Signal Company in 1893. This plant has 96 working levers. About 600 trains pass through this plant daily, which involves about 5,000 lever movements.

At Edgewood, Ill., there is an all-electric interlocking plant installed in 1896, which was one of the first Taylor plants ever built. At this place regular telegraph operators attend to the interlocking machine, so that the expense of operation is very light.

At Laurette, Ill., there is a mechanical interlocking plant installed in 1898. This machine has 13 working levers and it is in the telegraph office of the station building. At this point the Chicago Division crosses the Rantoul branch of the Springfield Division, and as there are no trains on the Rantoul line at night the signals are left clear for the Chicago Division, the levers being locked in the clear position. The telegraph office is securely locked while closed.

Automatic Electro-Gas Block Signals.

At the Illinois Northern crossing near 33d street and South Park avenue, Chicago, there is an interlocking plant of 12 working levers, installed in May, 1903, where the signals stand normally clear for the Illinois Central. When it is necessary for the infrequent trains on the Illinois Northern to pass over the crossing, the train-

men. of that company operate the interlocking machine. The door of the cabin is interlocked so that it must be closed before the first lever in the interlocking machine can be moved. After the train has passed through on the Illinois Northern the levers governing the Illinois Central derails and signals are reversed, and the last lever in the combination unlocks the cabin door. Time locks are applied to the home signal levers, so that a derail cannot be opened until a period of one and one-half minutes has expired after the home signal lever has been placed in the normal position.

The principal interlocking plants on the Chicago Division are Burnside, 133 levers; 16th and Clark streets, 128 levers; 67th street, 96 levers; Weldon, 92 levers; 43d street and Riverdale, 80 levers each; Ash street, 77 levers; Effingham, 60 levers. The largest interlocking on the St. Louis Division is that at Carbondale, 32 levers; on the Springfield Division, that at Springfield, 60 levers. On the other divisions the largest are: Freeport, at South Elmhurst, 32 levers; Dubuque, at East Dubuque, 18 levers; Omaha, at Webster City, 27 levers; Cherokee, at Manson, 21 levers; Louisville, at Henderson, 56 levers; Tennessee, at Fort Jefferson, 36 levers; Mississippi, at Winona, 16 levers; Louisiana, at New Orleans, four levers.

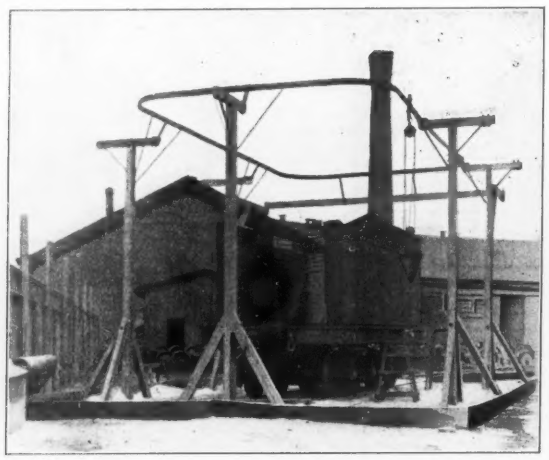


Fig. 1.—Sand Blast Apparatus for Cleaning Tender Tanks—Roanoke Shops, N. & W. Ry.

Some Interesting Adaptations—Norfolk & Western.

A sand blast apparatus for cleaning tender tanks at the Roanoke shops of the Norfolk & Western is shown in Fig. 1 of the accompanying engravings. Although it has been recommended for years that the sand blast be used for cleaning iron and steel, its use in cases such as the kind mentioned is not general. The arrangement

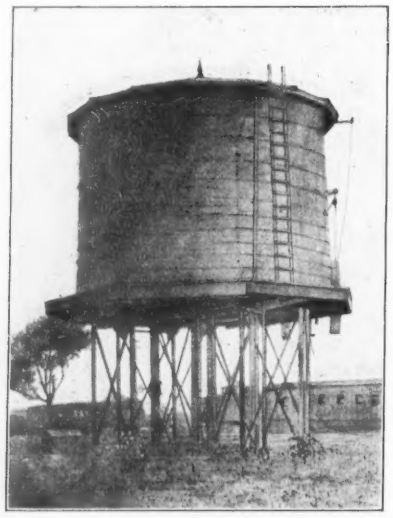


Fig. 3.—Water Tank Frame of Old Rails—N. & W. Ry.

consists of a heavy timber framing rising about a foot above the surface of the yard and enclosing a space large enough to hold a tender and the surrounding scaffolding for the accommodation of the workmen. On this framing there are six strong uprights carrying well-braced cross arms to which a lorrey track made of flat iron is attached. The lorrey running on this rail has a chain hoist from which is suspended an inverted conical sand holder with a hose leading from its bottom to the blast apparatus. The latter is supplied with air from the shop system. With this apparatus the paint can be removed from a tank much more thoroughly and in a far shorter time than is possible with the old method. The surface is left smooth and bright and in good condition for the reception of the new coat of paint.

Two turntables that were built on the premises a good many years ago have always attracted attention because of their unique design. One of them is shown in Fig. 2. It has a shallow floor braced by a truss girder built up of angles and channels and is driven by an engine in a cab at one end. A short time ago it was decided to replace one of these tables with another of more modern design capable of carrying the very heavy locomotives that are to be used. The old one was kept in service during the preliminary work of preparing the new foundation, and then when the new one was to be put in place, a temporary track was built across the pit and the new table run out over its position. With a wrecking crane at each end, it was lifted from its supports, and after the false-work had been removed, was lowered into place, the whole work taking less than two hours and a half.

An economical scheme practiced by the road is the use of old rails as supports for water tanks. A tank so supported is shown in Fig. 3. The rails are arranged to form 12 columns. Four of these, of two rails each, are placed in a square beneath the central part. The other eight are out at the edge, in line with the four at the center, the outer columns being of one rail each. The floor beams of the tank rest on cross pieces also made of old rails so that the larger part of the lower framing and supports is of this material.

The method of fastening and bracing these rails is shown in Fig. 4. The end of the rail itself is cut off square and rests on a steel plate 10 in. x 16 in. x ½ in. to which it is fastened by the angles, A A, that are riveted to its web. The plate

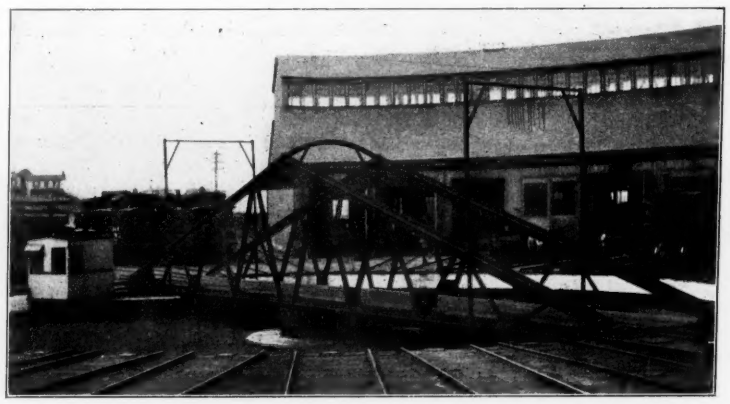


Fig. 2.—Turntable Built at Roanoke Shops—N. & W. Ry.

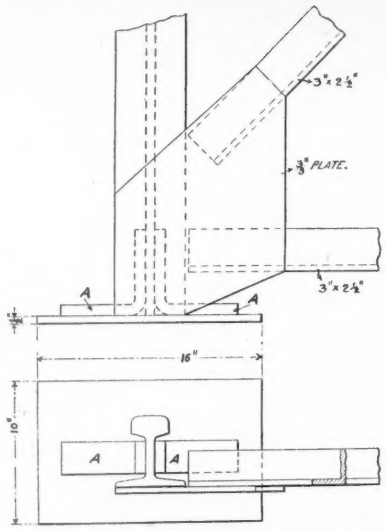


Fig. 4.—Foot of Rail Column for Carrying Water Tank. N. & W. Ry.

is in turn bolted to pier foundations. A broad gusset ⅜ in. thick is riveted to the flange of the rail and to this the diagonal and horizontal braces of 3-in. x 2½-in. angles are attached.

TECHNICAL.

Manufacturing and Business.

Mr. Stephen F. Sullivan, hitherto Sales Agent at Chicago for the Ewald Iron Company of St. Louis, has been appointed General Sales Agent.

The Ohio Machinery Company, Cincinnati, Ohio, has been incorporated with a capital of $5,000, by J. A. Trautman, Geo. E. Palmer, Jr., and others.

The Federal Bolt & Rivet Company, of Washington, D. C., has been incorporated with a capital of $1,000,000, by Edwin E. Crook, P. J. Kennedy and others.

The H. C. Doman Company, Oshkosh, Wis., has been incorporated, with a capital of $50,000, to make engines and machinery, by Edgar P. Sawyer, H. C. Doman and others.

Mr. E. H. Bowser has been appointed General Manager of the Southern Creosoting Company, Slidell, La., taking the place of Mr. C. B. Lowry, who has resigned to engage in other business.

The Phœnix Iron Works Co., Meadville, Pa., has appointed J. D. Lyon & Co., of Pittsburg, its representative for western Pennsylvania, eastern Ohio and West Virginia for the sale of engines, boilers, etc.

The American Electric Brake Co., Newark, has been incorporated in New Jersey with a capital of $100,000, to make electric machinery. Incorporators, Adrian I. Tichenor, Thomas L. Nixon and Lester W. Cokefair.

The Miller Plantation Company, 349 West 26th street, New York, N. Y., is in the market for the entire equipment of a railroad to be built in the State of Vera Cruz, Mexico. Second-hand material is preferred for both narrow and standard gage.

The South Texas Concrete Manufacturing Company, Galveston, Texas, has been incorporated with a capital of $10,000, to make hollow cement machinery and hollow concrete stone, by Thomas H. Phillips, Wm. Parr and others.

The Ryan-Parker Construction Company has been incorporated in New Jersey with a capital stock of $700,000, to do a general construction business, by James F. Fielder, James E. Pyle and Joseph F. Finn, Jr., all of Jersey City.

The M. Mitshkun Company, Detroit, is building new shops at Isabella and E streets, adjacent to the Michigan Central. A repair shop 100 ft. x 48 ft. is already finished and a frame office building, blacksmith shop, etc., will soon be finished.

Mr. G. DeWitt Smith, formerly Purchasing Agent of the Central Railroad of New Jersey, and afterwards Assistant Purchasing Agent of the Philadelphia & Reading, has taken a position with the Protectus Company, 45 Broadway, N. Y.

The Universal Pneumatic Transmission Co., Jersey City, has been incorporated in New Jersey to engage in conveying merchandise, grain and other commodities through tubes, by Joseph J. Stoetzel, Siegfreid Melohn and Harry P. Simonton.

The Stanley Electric Mfg. Co., of Pittsfield, Mass., announces the opening of two new sales offices, one in the Perin Building, Cincinnati, in charge of Mr. O. H. P. Fant, and the other in the Century Building, St. Louis, Mo., in charge of Mr. F. Johnson.

Mr. Albert J. Oliver has opened an office in Chicago as the representative of the E. L. Marbury Lumber Company, Cordele, Ga.; the Minnesota Lumber Company, Cordele, Ga., and the Allen-Wadley Lumber Company, Ltd., St. Louis, Mo. Mr. Oliver sells both long leaf and short leaf pine.

At a meeting of the board of directors of the Wm. Cramp & Sons Ship & Engine Building Company, Oct. 2, Mr. Chas. H. Cramp resigned and Mr. Henry S. Grove was elected his successor. Edwin S. Cramp was made Vice-President, and R. W. Davenport, General Manager and also a director.

A petition in involuntary bankruptcy against the New York Car Wheel Works, of Buffalo, was filed in the United States District Court Oct. 6, the petitioners being the Rochester Car Wheel Works, of Rochester; the Keystone Car Wheel Company, of Pittsburg, and Timothy J. Murphy, of New Jersey. The claims of the three petitioners aggregate about $30,000. It is set forth in the petition that the aggregate amount of the liabilities of the New York Car Wheel Works is about $800,000, and assets about $250,000.

The American Bureau of Inspection and Tests, Monadnock Block, Chicago, has been incorporated with J. Grunewald, President and Treasurer, and M. T. Jones, Inspecting Engineer. Mr. Grunewald has been credit man for the Block-Pollak Iron Company, Chicago, for 16 years, and Mr. Jones has been Inspecting Engineer for R. W. Hunt & Company for over 10 years. The new company will do a general business in inspecting and testing railroad materials, including rails, angle bars, cars and locomotives, bridge material, plates, cast iron pipe, etc., as well as chemical and physical tests whenever required.

A new plate mill, said to be the largest of its kind in the country, has just been completed by Worth Brothers Company, Philadelphia. It has been made thoroughly modern in every respect with all the latest improved machinery and labor-saving devices, including large guillotine shears, straightening rolls, etc. The longest rolls are 152 in., giving a capacity far in excess of present demands. A list of the maximum sizes of plates the mill is capable of turning out shows thicknesses up to 2 in. and widths up to 140 in. for the 2-in. gage, and up to 144 in. for the ⅞-in. gage and under. The lengths vary from 140 in. for the 2-in., 140-in. wide plate, to 600 in. for the ¾-in. by 30-in. plates. The capacity of the plant is from 4,500 to 5,000 tons of plates a week.

Iron and Steel.

The Dover Iron Company will rebuild its furnace at Bear Springs, Tenn., recently damaged by fire.

The Manufacturers' Foundry Company, of Waterbury, Conn., has increased its capital stock from $10,000 to $50,000.

The Monarch Blast Furnace Company, of Liberty Furnace, Va., has been incorporated with a capital stock of $800,000. John Gaffney is President.

The Central Foundry Company, Birmingham, Ala., which has been closed on account of accumulation of material, will resume work at once, the surplus stock having been worked off.

The Mexican Central has placed a large order for rails with the Monterey Iron & Steel Company, of Monterey, Mexico. The Chihuahua division of the road is now being relaid with 75-lb. rails, replacing the 56-lb.

The Allentown Foundry & Machine Works, Allentown, Pa., is building a new machine shop 80 ft. x 200 ft., and will also make large additions to the foundry. New machines are to be put in to do machine-shop work.

If the high water holds long enough, about 60,000 tons of rails which are now being loaded on 70 barges, will soon start from Bessemer on the way to New Orleans. Some of these rails are for the Southern Pacific, some for Mexico and some for Europe.

At the annual meeting of the New Haven Iron & Steel Co. Oct. 5, the following directors were elected for the ensuing year: C. C. Kauffman, A. Loudon Snowden, Kennedy Crossan, L. S. Filbert, Charles A. Porter, John B. Peddle and George D. Watrous.

The Lacey-Buck Iron Company of Trussville, Ala., will increase its capital stock from $500,000 to $600,000. The furnace has been enlarged, increasing the output from 75 to 200 tons. This company has acquired ore and coal lands and has built additional coke ovens which give it raw materials at first hand.

James Bonar & Co., Inc., of Pittsburg, Pa., capital $75,000, has taken over the business of James Bonar & Company. A machine shop is to be built, and the company will also do galvanized iron work. The officers are James Bonar, President; Reed F. Blair, Vice-President; James Cawley, Secretary, and Geo. J. Seamans, Treasurer.

Bids were opened at the Navy Department on Oct. 1 for 16,639 tons of armor for the battleships "Vermont," "Minnesota," "Kentucky," "Mississippi" and "Idaho." The Carnegie Steel Co. and the Bethlehem Steel Co. each bid $6,944,000 (nearly 21 cents per lb.), delivery to begin in nine months, the two bids being identical, while the Midvale Steel Co., the only other bidder, bid $6,606,932, delivery to begin in 20 months.

The Warwick Iron & Steel Company, of Philadelphia, has been improving its financial condition. Of $225,000 borrowed from the banks, the company has paid off $100,000, and the earnings for the first six months of 1903 were over $100,000 for the stock as against $61,000 net earnings in the entire fiscal year 1902. The new construction work is now over and smaller sums will have to be spent for improvements. The Warwick Company turns out about 520 tons of iron daily from its two furnaces. It will probably restrict the output 20 per cent. in the near future.

Hollow vs. Drilled Staybolts.

A correspondent writing recently to *Locomotive Engineering* speaks of the persistence of some roads in what he calls "the criminal practice of plugging up the holes in drilled staybolts that have been broken in service, rather than make immediate repairs." He says the drilled staybolt is at best only a makeshift, and a large percentage of the drilled holes are not in the center of the bolt, weakening it. He advocates the use of the hollow staybolt, since it cannot be thus plugged; for if a plug is inserted at the outside to stop the escape of steam and water, it goes into the fire-box with injurious results to the fire.

New Southern Hydro-Electric Power Plant.

The Winding Shoals Electric Power Co., a company recently incorporated at Buford, Ga., will install a 6,000 h.p. hydro-electric plant on the Chattahoochee River, four miles west of Buford, Ga. The dam and power house are situated between high bluffs composed almost entirely of granite. The plans contemplate the construction of a crib dam for which there is an abundance of material near by. The power house will be stone and concrete. The first equipment of wheels and generators will be about 3,000 H.P. ultimately to be increased to 6,000. A portion of the power will be used by local factories in Buford, which is the largest leather manufacturing district in the South, and for the Atlanta, Buford & Gainesville Railroad, for which a survey is now being made. The balance of the power will be transmitted to Atlanta and surrounding towns; the bulk of it will most likely be taken to Atlanta. The Electrical Equipment Co., Monadnock Building, Chicago, is preparing the plans and specifications and will soon be ready to receive bids for the machinery equipment and construction work.

Boiler Design.

The Master Mechanics' Committee on Boiler Design has sent out a circular containing the following inquiries:

1. What minimum depth of water over highest point of crown-sheet do you use or recommend (a) for curved crown-sheets, (b) for flat crown-sheets?

2. The distance from vertical line of boiler to water glass (a) for curved crown-sheets, (b) for flat crown-sheets?

3. What exposed length of water glass do you use or recommend?

4. How are gage cocks located with reference to water glass?

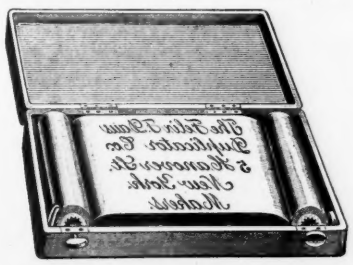
5. If crown-sheets are sloped, how much per foot, and why?

6. Is an automatic low-water detector a desirable attachment for general use on locomotives? By an "automatic low-water detector" is meant a device giving warning when water is below safe level.

Replies should be sent to D. Van Alstyne, Chairman, Superintendent Motive Power, Chicago Great Western, St. Paul, Minn.

A Simple Duplicator.

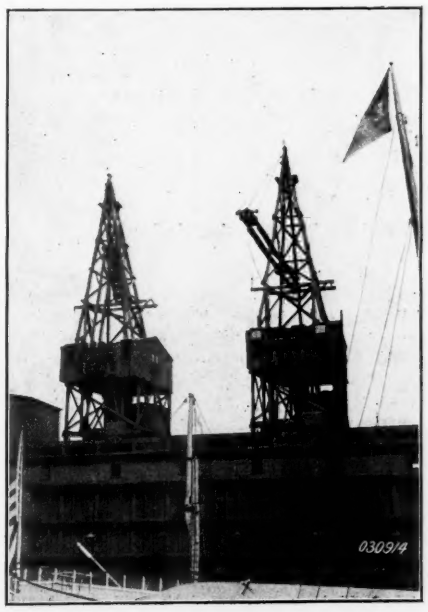
The accompanying engraving shows a simple form of duplicating apparatus by means of which 100 copies from a pen-written or 50 copies from a typewritten original can be made quickly and easily. The coated negative paper is stretched between the two rollers and the original, written with a special ink or typewriter ribbon, having been dried, is laid face down on the negative paper, smoothed lightly with the hand and allowed to adhere about two minutes. The negative is then ready for printing and the sheets to be printed are one after



another laid on the negative paper and smoothed out by hand. The negative paper comes in rolls 5½ yards long and may be used over and over from five to ten times, the previous impressions having no effect on the succeeding copies. The machine is made in four sizes, the largest taking sheets 20¾ in. x 23½ in. There is no printer's ink, no press and no washing required, and no mechanism to get out of order. It is a convenient method of copying bills of lading, receipts, orders and similar papers, and is now in use in a large number of railroad offices. Felix F. Daus Duplicator Co., New York, is the maker.

Unloading Coal at the Lincoln Wharf Power Station of the Boston Elevated Railroad.

In the *Railroad Gazette* Sept. 11, page 658, was noted the record of a performance of the coal-handling machinery at Lincoln wharf power station of the Boston Elevated R. R. in unloading a cargo of coal. Run-of-mine bituminous coal was raised 90 ft. above tidewater from one hatch of a vessel and delivered to the storage pockets, cracked to mechanical stoking size, at the rate of 320 tons an hour by one tower. The builders of the machinery, C. W. Hunt Company, West New Brighton, N. Y., say this is an advance of about 200 per cent. over previous performances of this nature, which makes the record remarkable. Ordinarily in such installations



engines of 50 to 100 h.p. total are used, but this plant requires 300 h.p. The machinery is correspondingly powerful and the coal-cracking machine attached to the tower cracks to the proper dimensions for automatic stokers, before passing to the pocket the great quantity of coal—over 5 tons per minute—delivered to it from the hoisting machinery. The ordinary small steam shovel has been supplanted by an automatic shovel of 2 tons capacity.

The time occupied in raising 2 tons of coal from the hold of a vessel to the discharging hopper, nearly 100 ft. above, is 6 seconds. The round trip, which involves lowering and moving the shovel out on the boom, opening the former, digging up 2 tons of coal, raising it to the level of the hopper and discharging it, is often made in 22 seconds.

The two towers are shown in the illustration. The plant is similar in design to, but is heavier in its proportions than, the standard Hunt steeple tower rig, the moving gear and coal cracker being electrically driven and the hoisting engine direct-connected. The towers traverse overhead the whole length of the coal storage pocket and move 30 ft. at a time without changing steam connection. In this way a single tower can operate on each hatch of a vessel in turn, or several towers can work simultaneously. The boom, which is made to fold up to avoid fouling the rigging of vessels being brought to the wharf, has an overhang of 40 ft., and enables the tower to operate on coal steamers of the widest beam and largest dimensions.

Steel Casting Plant of Cooper-Wigand-Cooke Company.

At Delawanna, N. J., on the Delaware, Lackawanna & Western, midway between Hoboken and Paterson, there has just been completed a steel casting plant by Cooper-Wigand-Cooke Company. These shops occupy 12½ acres and the monthly capacity will be about 2,000 tons of open-hearth steel castings. Work of every description will be done, including both small and large, and complicated and cored. The fires have already been started and the first castings are expected to be made Oct. 15. The Cooper-Wigand-Cooke Company was organized about a year ago to succeed to, and enlarge the business of Messrs. Cooper & Wigand, who had been making structural and ornamental iron work and bridges for some five years at shops in Newark, close to the Pennsylvania Railroad, and to build this establishment. The officers of the new company are: President, John Cooper; Vice-President, John K. Cooper; Secretary and Treasurer, A. A. Wigand. The directors include the above named officers and Oakley W. Cooke, E. Parson Cooke and Alexander Moffett.

The steel castings department is in charge of Oakley W. Cooke, who formerly was in charge of the steel furnaces of the Passaic Steel Company at Paterson, N. J. John K. Cooke has been General Manager of the Passaic Steel Company for some 20 years. Until five years ago, when the company of Cooper & Wigand was formed, John Cooper was Secretary and General Manager of the Jackson Architectural Iron Works for some 16 years, and Mr. Wigand was Chief Engineer of that firm for about 10 years. The structural iron shops and bridge works in Newark cover 6½ acres, and their capacity is 10,000 tons of structural steel a year, besides ornamental iron. The main office of the Cooper-Wigand-Cooke Company is 152 West 34th street, New York City.

THE SCRAP HEAP.

Notes.

The Union Pacific has taken over the entire commissary department of all the lines from Omaha to Portland, which for 30 years has been operated by the Pacific Hotel Co. The transfer includes all dining cars, eating houses, and six large hotels.

The Michigan Central has been ordered by the Michigan State Railroad Commissioners to reduce its passenger rates to 2½ cents per mile on its Grand River Valley Division from Grand Rapids to Jackson, Mich. This will make the fare to Detroit $3.87, as against $4.36 via the Pere Marquette, which has the shorter route and a readjustment of fares on all lines is looked for.

The "Interstate Commerce Law Convention," which was the title of a meeting held in St. Louis two or three years ago, but which has never met anywhere since, has issued a circular, to be sent to commercial bodies throughout the country, trying to arouse interest in the alleged movement to secure legislation to more effectively regulate interstate rates. In some of the items published in the daily newspapers last week announcing this action the word "convention" is printed "commission," conveying the idea that the members of the Interstate Commerce Commission are agitating for the enlargement of their powers. That proof reader seems to have the happy faculty of reading wishes as well as words.

Some of the employees of the Pennsylvania Railroad, at Altoona, for two or three years have been persistently followed by certain collection agencies of West Virginia, Illinois, and Missouri, the peculiar laws of those States making it possible for persons residing there to buy claims of Pennsylvania merchants against citizens of Pennsylvania and then attach money in the hands of the employer (the railroad company) due to the employees who are sued. Over 1,500 employees have thus had their wages tied up, the sum of money involved being over $30,000. The pay department of the Pennsylvania having been greatly annoyed by these proceedings, the officers of the company took up the matter in the courts; and after prolonged litigation have succeeded in securing a general release, discharging the company from liability as garnishee; and the money is now to be paid over to the employees.

The New York State Court of Appeals has affirmed the judgment of the lower court against Frederick Wadhams, a notary public of Albany, who used a Pullman Company pass, declaring him a public officer within the meaning of the law, which prohibits such officers from using or accepting free transportation. The court holds that a Pullman pass is to all intents and purposes a railroad pass within the meaning of the law. "Parlor and sleeping car accommodations have come to be regarded as a necessity by a considerable portion of the traveling public, and rather than not have the benefit of such accommodations a substantial percentage of the traveling population pay for the privilege of enjoying them. A public officer who accepts the privilege of riding in a palace or sleeping car accorded to him by a pass such as was issued in this case accepts a free pass and free transportation within the meaning of the constitution,

Press despatches say that the Rock Island road has agreed to restore passenger rates between Chicago and St. Paul on Oct. 16, and that, therefore, the long continued rate war is settled. At a meeting of the Western Passenger Association in Chicago last Tuesday it was unanimously voted to advance the fare from $8 to $11.50. The new rate goes into effect Oct. 8 on all lines except the Rock Island. The long drawn out contention over the form of a new interchangeable mileage ticket appears to be ended. After two days of discussion an adjustment was reached by which there will be three kinds of mileage tickets, a 4,000-mile interchangeable mileage credential, good on all lines in the Western Passenger Association; a 2,000-mile interchangeable credential, good only on such roads as desire to use it; the new refund ticket, good on trains, to be used only by such roads as desire to use it. A committee was appointed to see about consolidating the three mileage bureaus.

Around the World in 47 Days.

A young Englishman started Sept. 9 to make a journey round the world within 50 days on a wager. Mr. W. A. Schulze, an official of the German Imperial Post-office, which publishes the most complete of international railroad guides, gives the time-table of the trip as follows:

Leave—			Arrive—			Distance.	
London	8:25 p. m.	Sept. 9	Berlin	6:58 p. m.	Sept. 10	664	"
Berlin	7:30 p. m.	Sept. 10	Moscow	3:30 p. m.	Sept. 12	1,208	"
Moscow	10:40 p. m.	Sept. 12	Dalni	7:00 a. m.	Sept. 26	5,354	"
Dalni (steamer)	.....	Sept. 27	Nagasaki	.....	Sept. 29	697	"
Nagasaki	6:38 p. m.	Sept. 29	Yokohama	6:00 p. m.	Oct. 1	683	"
Yokohama (steamer)	.....	Oct. 2	Vancouver	.....	Oct. 14	4,929	"
Vancouver	1:30 p. m.	Oct. 15	Montreal	5:05 p. m.	Oct. 19	2,907	"
Montreal	7:30 p. m.	Oct. 19	New York	8:55 a. m.	Oct. 20	469	"
New York (steamer)	.....	Oct. 20	Plymouth	12:00 m.	Oct. 26	3.444	"
Plymouth	1:45 p. m.	Oct. 26	London	6:55 p. m.	Oct. 26	247	"
Time		47 days	Distance			20,802	miles

The distance by sea is 8,373 miles, plus the passage from England to Flushing, which is not given separately.

Mr. Schulze also makes out a time-table for the journey from Berlin westwards, in which he sends his traveler from New York through Minneapolis to the Canadian Pacific, and brings him back to Berlin in 47 days, with 11,615 miles of railroad travel and 20,418 in all, or 184 miles less than by the other route.

Public Corporations and the Public.

General Budde, the Prussian Minister of Public Works, after a vacation in Switzerland, made some general remarks at one of the railroad centers, one of which at least is worth bearing in mind wherever there are railroads or other institutions engaged in serving the public: "The railroads exist for the sake of the public; not the public for the sake of the railroads." Doubtless, in a State system, where there is absolutely no competition, this needs especially to be brought to the attention of employees; but there is need of it elsewhere also. In not a few public and other offices, methods are adopted for the convenience of employees which waste five hours of the public's time in order to save one hour for the employees.

Train Speeds in South Africa.

The *Cape Times* has been investigating the speeds of trains on the Cape Government Railway. It draws a humorous but not very gratifying comparison between the Cape railroads' speeds of to-day and those of Robert Stephenson's famous "Rocket" of three-quarters of a century ago. That venerable engineering antiquity had an average speed of 14 miles an hour, and a maximum of 29. It appears that the trains now running between Capetown and Port Elizabeth, the two principal cities in Cape Colony, attain a maximum speed which is one mile under the "Rocket's" record of 75 years ago, while in revenge the mean speed of the Cape Government Railway's train on that service is 18 miles an hour, thus actually beating the first locomotive that was ever built by four miles an hour.—*The Engineer.*

Delirium Tortuosum.

When the first railroad in Germany was under consideration—it was to be but 3¾ miles long, from Nuremberg to Fürth—the medical experts of the town of Fürth reported, in all seriousness: "Change of place by means of any kind of steam engine should be prohibited in the interest of the public health. The rapid movement cannot fail to produce in the passengers the mental disturbance called 'delirium tortuosum.' Granting that the passengers may voluntarily expose themselves to this danger, the government must at least protect the spectators. For the sight of a locomotive rushing along at full speed suffices to cause this fearful disease. It is therefore indispensably necessary that a screen, at least 5 ft. high, be erected on each side of the road." This was about 1833, when there had been already experience enough in England and America to show what actually was the danger of catching "delirium tortuosum" from a railroad train. If Fürth were not in Bavaria, one might suspect that these medical experts had tarried too long over the beer mug when they made this delirious report.

The Metropolitan Street Railway Association.

At the meeting in New York October 3 on the seventh anniversary of the formation of the Metropolitan Street Railway [Employees'] Association, President Vreeland made an address in which he said: "During the year, through the influence of this association, has been achieved another of those peaceful victories in the relations of capital and labor in that by negotiation and agreement substantial addition to compensation has been made.

"The first results of the pension system applicable to our members have been shown, and during the year 15 veterans have been put on the retired list. In no year since we have been together have we been brought into closer touch, for never before have outside influences been so active in attacking our property and our work. I am pleased to notice that the only effect of all the discussion and the parade of our affairs has been to bring you closer together and to emphasize the fellowship which was at the foundation of our association.

"Since we last met I have traveled far and seen many properties like ours, devoted to the public service, and I am proud to tell you that nowhere had I cause to feel anything but flattered by the unavoidable contrast which naturally comes to mind under these circumstances. Nowhere—and I investigated public service corporations under three different forms of government and 20 odd forms of management—was there anything like the conditions under which we exist. The loyalty and pride for the employing concern which has been developed here I found absent everywhere I went, and nowhere was there any trace of that fellowship and social intercourse which, on such occasions as this, brings all hands together for mutual encouragement and relaxation. In many places where the working forces are considered statistically the figures showed that conditions had recently been made better for the men, but when considered on the broader ground of co-operation and mutual assistance our idea seems never to have occurred to our friends across the water.

"Such efforts as were there afoot for the betterment of the working forces were in the nature of gifts or patronage from the control, and in nothing more than in this was the pleasant contrast I spoke of more flattering. We have done our own work of combining for mutual benefit, and we are not the objects of patronage. We own, as an investment, an interest in the property we operate, and we help each other from our own purse. And this is as it should be, for on no other plan can men secure the mutual respect which is the very foundation of confidence."

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular mettings of railroad associations and engineering societies see advertising page xvi.)

Car Foremen's Association of Chicago.

The annual meeting of this association will be held Oct. 14 at Chicago, Ill. Reports from the officers will be read, and new officers are to be elected for the coming year. The secretary is Aaron Kline, 1146 Willard avenue, Chicago, Ill.

The American Railway Association.

The fall session of the American Railway Association will be held at the Masonic Temple, Richmond, Va., on Wednesday, October 28. Reports will be presented by the following committees: Executive Committee; Committee on Train Rules; Committee on Car Service; Committee on Safety Appliances; Committee on Statistical Inquiry; Committee on Standard Cipher Code, and Committee on Nominations. Three members of the Committee on Car Service, three members of the Committee on Safety Appliances and two members of the Committee on Nominations are to be elected. W. F. Allen Secretary, 24 Park Place, New York.

Association of Railway Superintendents of Bridges and Buildings.

The next annual meeting of this association will be held at Hotel Chateau de Frontenac, Quebec, Can., Oct. 20. The following subjects, it is said, will be reported by committees:

"False work for rocky bottom in rapid currents where piles cannot be driven." John P. Cantry, Chairman.

"Should ties for bridges be gaged so as to leave the rail without camber, or only a portion of the camber be taken out." R. H. Reid, Chairman.

"If one arm of an important metal drawbridge over a deep stream should be wrecked, what is the most expeditious way to restore railroad and water traffic." John D. Isaacs, Chairman.

"What is the best form of traveler to use in building street railway bridges, spans up to 200 ft." G. W. Smith, Chairman.

"Best method of protecting solid steel floors of bridges." A. O. Cunningham, Chairman.

"Best plans for small tool houses." J. B. Sheldon, Chairman.

"Best sanitary arrangements for small stations, where there are no water or sewer systems." J. H. Markley, Chairman.

"Method of making annual inspection of bridges and culverts, and form of report to be made." Walter G. Berg, Chairman.

"Purifying water for engine use by filtration or other methods." R. C. Sattley, Chairman.

"Method of storing fuel oil, with appliances for supplying locomotives." C. C. Mallard, Chairman.

"Experience in the use of concrete under bridge bed plates, and turntables in place of pedestal stones; also best form and material for bed plates under iron bridges." Walter A. Rogers, Chairman.

S. F. Patterson, Secretary, Concord, N. H.

PERSONAL.

—Mr. R. T. Heed, Advertising Manager of the St. Louis & San Francisco Railroad, has resigned to enter the employ of the Con V. Curran Printing Company of St. Louis.

—Mr. J. A. White, the new Assistant Superintendent of the Washington Division of the Southern Railway at Alexandria, Va., was for about five years Superintendent of the Oxford & Henderson. When this road was leased to the Richmond & Danville, he was appointed Agent at Oxford, N. C., and later was transferred to Durham, where he remained until appointed Superintendent of the Danville & Western in 1900. Mr. White resigned from this latter position to go to the Southern as Assistant Superintendent, with jurisdiction over the Bluemont and Harrisonburg Branches.

—Colonel Orland Smith, for a number of years Third Vice-President of the Baltimore & Ohio, died at Chicago, Oct. 3. Col. Smith was born at Lewiston, Me., in 1825, and began his railroad service as Station Agent on the Androscoggin & Kennebec in 1849. In 1853 he went to the Marietta & Cincinnati, where he remained until 1861, when he entered the army as Colonel. He commanded the Second Brigade of the Eleventh Army Corps. In 1900 he was chosen President of the Army of the Potomac. For several years after the war he was a railroad contractor, and in 1877 re-entered railroad service as General Superintendent of the Columbus, Hocking Valley & Toledo, later becoming Vice-President and General Manager. In 1882 he became Third Vice-President of the Baltimore & Ohio and was made First Vice-President in 1888. Col. Smith was one of the Board of Managers of the Joint Traffic Association, which was organized in December, 1895, and he remained as such until its dissolution in 1898.

—Mr. Lucius E. Johnson, the new President of the Norfolk & Western, is a native of Aurora, Ill. Mr. Johnson began railroad service in 1866 as a fireman on the Chicago, Burlington & Quincy, and was in the locomotive department until 1886, when he went to Beardstown, Ill., as Superintendent of the St. Louis Division. In December, 1888, he returned to Aurora as Superintendent of the Chicago Division. In 1890 Mr. Johnson went to Montana to be Superintendent of the Montana Central at Helena for about three years. Then he went to the Lake Shore & Michigan Southern and for about four years (1893-1897) was Superintendent of the Michigan Division. In 1897 he went to the Norfolk & Western as General Superintendent and two years later was promoted to the General Managership. The comprehensive scheme of improvements described in the series of articles recently published in the *Railroad Gazette* was planned and executed under the supervision of Mr. Johnson. He has been in close personal touch not only with his own corps of engineers, but also with the contractors, and foremen having the work in charge, and has followed each step in its progress from the first suggestion to its final execution, whether it be the elimination of a bad curve in the mountains, the construction of a yard, the enlargement of a tunnel or the elevation of a section of the track. His familiarity with minute details of the work is thorough, and this covers also the method of operation that is to follow. It is believed to be due to his initiative that the work was begun and to his executive ability that it will be successfully finished.

ELECTIONS AND APPOINTMENTS.

Annapolis, Washington & Baltimore.—W. E. Slaughter has been appointed Acting Auditor, with headquarters at Annapolis, Md., succeeding C. F. Gladfelter, resigned.

Atlantic Coast Line.—W. P. Cline has been appointed Superintendent of Telegraph, with headquarters at Wilmington, N. C., succeeding F. D. Cudlipp.

Belington & Beaver Creek.—C. A. Bickett has been elected Vice-President; J. J. Jones, Secretary, and T. B. Wilcox, Treasurer.

Brunswick & Birmingham.—D. Brown has been appointed Superintendent of Motive Power, with headquarters at Brunswick, Ga., succeeding M. W. Cahill.

Coahuila & Zacatecas.—J. A. Campell has been appointed

Auditor, with office at Saltillo, Mex., relieving P. M. Dodge, Assistant Traffic Manager, to this extent.

Chicago, Burlington & Quincy.—W. G. Sharretts, hitherto Vice-President, Superintendent and General Freight and Passenger Agent of the Fulton County Narrow Gage, has been appointed Superintendent of the C., B. & Q., with headquarters at Burlington, Iowa, succeeding J. H. Duggan, resigned.

Chicago, Rock Island & Pacific.—D. A. Hathaway has been appointed Master Mechanic, with headquarters at Fairbury, Neb., succeeding A. McCormick. (See Colorado Springs & Cripple Creek District.)

L. B. Allen, hitherto Superintendent of the Great Northern, has been appointed Superintendent of the Cedar Rapids Division of the C., R. I. & P., with headquarters at Cedar Rapids, Iowa.

Choctaw, Oklahoma & Gulf.—F. B. Stewart, hitherto Acting Superintendent of the Western Division, has been appointed Superintendent of the Eastern Division, with headquarters at Little Rock, Ark., succeeding R. E. Cahill, resigned. W. M. Whitenton, hitherto Trainmaster at Shawnee, Okla. T., has been appointed Superintendent, with headquarters at Oklahoma City, Okla. T., succeeding Mr. Stewart.

Colorado & Wyoming.—The officers of this company are: President, F. J. Hearne; Vice-President and Traffic Manager, C. A. Parker; Secretary and Treasurer, A. A. Miller, and General Manager, J. T. Kebler.

Colorado Springs & Cripple Creek District.—A. McCormick has been appointed Master Mechanic, with headquarters at Colorado Springs, succeeding Owen Owen, resigned.

Durham & Charlotte.—H. S. Jones has been appointed Master Mechanic. This is a new position recently created.

Erie Railroad.—T. J. English has been appointed Superintendent of the Mahoning Division, with headquarters at Dunmore, Pa., succeeding J. M. Barrett, who has been appointed Superintendent of the Chicago & Erie Railroad, succeeding James Corbett, assigned to other duties. Mr. Barrett's headquarters will be at Huntington, Ind.

Fulton County Narrow Gage.—See Chicago, Burlington & Quincy.

Grand Trunk.—J. W. Higgins has been appointed Assistant Superintendent, with headquarters at Island Pond, Vt., succeeding C. S. Cunningham, who has been transferred to London, Ont., succeeding W. E. Costello as Assistant Superintendent. Mr. Costello has been transferred to Battle Creek, Mich.

Grand Trunk Pacific.—E. R. McNeill, heretofore Resident Engineer of the Great Northern, at Havre, Mont., has been appointed District Engineer of the G. T. P., with headquarters at Edmonton, N. W. T.

Great Northern.—J. C. Howard, hitherto Assistant Superintendent at West Superior, Wis., has been appointed Superintendent of the Dakota Division, with headquarters at Larimore, N. Dak., succeeding L. B. Allen, resigned. (See Chicago, Rock Island & Pacific.)

J. D. Mason, Chief Engineer of the Eastern Division, with headquarters at West Superior, Wis., has resigned.

Hocking Valley.—W. N. Cott has been elected a Director, succeeding Myron T. Herrick.

Illinois Central.—C. L. Ewing, hitherto Assistant Superintendent, has been appointed Superintendent of the St. Louis Division, with headquarters at Carbondale, Ill., succeeding W. S. King, who has become Assistant General Superintendent of the Yazoo & Mississippi Valley, with headquarters at Memphis, Tenn.

Louisiana & Arkansas.—J. H. White, hitherto Superintendent, has been appointed General Superintendent, with headquarters at Stamps, Ark.

Mexican.—D. W. Harvey, hitherto Assistant to the General Manager, has been appointed to succeed General Manager V. Brummer, resigned, with the title of Assistant to the Managing Director. Mr. Harvey's headquarters will be at the City of Mexico.

Mexican Central.—The headquarters of J. F. Casey, Superintendent, have been removed from Tulancingo to Pachuca, Mex.

Minneapolis & St. Louis.—G. D. Brooke, Superintendent of Machinery and Equipment, with headquarters at Minneapolis, Minn., has resigned.

Oregon R. & Navigation.—J. H. Hyde has been elected a Director, succeeding H. W. Cannon.

Peoria & Pekin Union.—F. L. Tompkins, General Superintendent and Purchasing Agent, and W. E. Bell, Assistant Superintendent, have resigned.

Rock Island Company.—B. F. Yoakum has been elected a Director, succeeding A. R. Flower.

St. Louis Southwestern.—Howard Gould has been elected a Director.

Southern.—G. V. Peyton, hitherto Trainmaster, has been appointed Assistant Superintendent of the Branch Lines of the Danville Division (except the Rocky Mount Branch), with office at Greensboro, N. C.

West Virginia Northern.—J. L. Davis has been appointed General Manager, with headquarters at Tunnelton, W. Va., succeeding A. M. Lane, resigned.

Yazoo & Mississippi Valley.—(See Illinois Central above.)

Zanesville & Western.—J. F. Angell, Superintendent, with headquarters at Columbus, Ohio, has resigned and that office has been abolished.

LOCOMOTIVE BUILDING.

The Midland Valley is having two locomotives built at the Baldwin Works.

The Colorado & Wyoming is having one locomotive built at the Baldwin Works.

The Quakertown & Eastern is having one locomotive built at the Baldwin Works.

The Southern is having 25 locomotives built at the Pittsburg Works of the American Locomotive Company.

The Miller Plantation Company, 349 West 26th street, New York, is in the market for the entire equipment of a railroad 10 miles long in the State of Vera Cruz, Mexico. Second-hand material preferred.

F. M. Hicks, of the Hicks Locomotive & Car Works, has received the following orders: Butte City R. R., one 35-ton engine; Hecla Belt Line, one four-wheel switching engine; International Harvester Co., one four-wheel switching engine; General Construction Co., Davenport, Iowa, one 50-ton engine.

CAR BUILDING.

The Pullman Company is building 33 coaches for its own service.

The American Car & Foundry Co. has miscellaneous orders for 130 cars.

The Caswell Car Company, Chicago, has miscellaneous orders for 700 cars.

The Vandalia has ordered eight cabooses from the American Car & Foundry Co.

The El Paso & Southwestern is having three coaches built by the Pullman Company.

Nelson, Morris & Company, Chicago, is building 200 refrigerator cars at its own shops.

The Chicago & Western Indiana is in the market for from 250 to 300 100,000-lb. gondolas.

The Grand Rapids & Indiana has ordered 30 steel gondolas from the American Car & Foundry Co.

The Peerless Tank Line, Cleveland, Ohio, has placed orders for 30 steel tank cars of 8,000 gal. capacity.

The Richmond, Fredericksburg & Potomac has ordered five passenger coaches from the American Car & Foundry Company.

The Cold Blast Transportation Co., Chicago, has ordered 100 refrigerator cars from the American Car & Foundry Co.

The West Side Belt is in the market for 500 freight cars, but it has not been definitely decided when the equipment will be purchased.

The Schwarzchild & Sulzberger Packing Company have ordered 100 refrigerator cars of 60,000 lbs. capacity from the American Car & Foundry Company.

The Chicago & North Western has ordered eight 60-ft. baggage cars, four 60-ft. mail cars, four 50-ft. mail cars and two combination buffet, smoking and baggage cars from the Pullman Company.

The Miller Plantation Company, 349 West 26th street, New York, is in the market for the entire equipment of a railroad 10 miles long in the State of Vera Cruz, Mexico. Second-hand material preferred.

The Nashville, Chattanooga & St. Louis expects to build during the next two or three months 250 drop bottom gondola cars of 80,000 lbs. capacity. The specifications for these cars were published in our issue of March 6, last.

The Missouri Pacific has ordered one World's Fair train from the American Car & Foundry Co. This train will be composed of one vestibule car, one combination baggage and express car, one first class coach, one second class coach, one chair car and one dining car.

The Atchison, Topeka & Santa Fe, as reported in our issue of October 2, has ordered 10 express cars of 60,000 lbs. capacity from the Pullman Co. The cars will be 40 ft. long, 8 ft. 6 in. wide and 7 ft. 4¼ in. high, inside measurements, and built of wood and steel. The special equipment includes: Commonwealth bolsters, National-Hollow brake-beams, Westinghouse air-brakes and Miner draft rigging.

F. M. Hicks, of the Hicks Locomotive & Car Works, has orders for the following equipment: West Virginia & Southern, one coach; Green Bay & Western, one 57 ft. combination coach; Santa Fe Central, one private car and 15 tank cars; Duluth, Missabe & Northern, three passenger coaches; Duluth & Iron Range, one passenger coach and one combination car; Louisiana Northwestern, three coaches; Newton & Northwestern, 30 gondolas; Muncie, Hartford & Fort Wayne, 12 flat cars, and the Ohio River & Columbus, 14 cars.

The Bessemer & Lake Erie, as reported in our issue of Oct. 2, has ordered two coaches from the American Car & Foundry Company for February, 1904, delivery. These cars will be 60 ft. long and 9 ft. 8 in. wide, with a seating capacity of 70 persons. Special equipment includes Westinghouse-American brakes, Buhoup couplers, draft rigging and springs, Forsyth curtain fixtures, Pantasote curtain material, metal brake-beams, M. C. B. cast iron brake-shoes and journal boxes, McCord journal box lids, American Car & Foundry Co.'s platforms, roofs, seats and vestibules, six-wheel trucks of 60,000 lbs. capacity, and 36-in. steel tired wheels.

BRIDGE BUILDING.

AKRON, OHIO.—The Akron & Barberton Belt Line will, it is reported, build a steel bridge, with concrete abutments, at Brown street.

BRAINERD, MINN.—Bids are wanted Oct. 10 by A. Mahlum, County Auditor, for building a steel bridge over the Mississippi River in Perry Lake Township.

BROCKVILLE, ONT.—The Brockville, Westport & Sault Ste. Marie proposes to build a bridge over the St. Lawrence River at this place.

CAMBRIDGE, MASS.—The city may build a highway drawbridge over Lachmere canal, for which bids will be asked early next year. The sum of $50,000 is to be borrowed by the city to pay for this work. J. W. Pierce, City Engineer.

CHATHAM, ONT.—Plans have been made by W. G. McGeorge, C. E., for a steel bridge to be built over Read's ravine, on the River road, the work to be carried out by Harwich Township Council.

DAYTON, OHIO.—Plans are being made, it is reported, for the building of a concrete steel bridge at Third street; also for work on the bridge between Riverdale and North Dayton, which the council has approved, and which will cost about $25,000. F. M. Turner, City Engineer.

FRESNO, CAL.—The county has under consideration the building of a bridge over the San Joaquin River to cost $30,000. W. O. Miles, County Clerk.

HAMBURG, MISS.—A petition will be made to the county to issue bonds for the building of four steel bridges.

HARRISBURG, PA.—Engineers are preparing plans for three new roll lift bridges at Harrison, 22nd and Main streets; also for new bridges at Jackson and Adams streets.

HENDERSON, KY.—At a meeting of the Fiscal Court of this county, it was decided to build an iron bridge over Canoe Creek, on the Spottsville road. The court is considering the replacing of many wooden bridges in the county with iron structures.

KANSAS CITY, KAN.—Wyandotte County Board of Commissioners has instructed County Clerk Holcomb to advertise for bids for the Fifth street bridge to be built in Armourdale.

KEEWATIN, ONT.—The Ontario Government is considering a project to build a steel bridge over an arm of the Lake of the Woods at Keewatin. The wooden floating bridge now in use is in a dangerous condition.

LISBON, OHIO.—Bids are wanted Oct. 22, by J. F. Adams, County Commissioner, for the steel work for several county bridges.

LOWELL, MASS.—Residents of this place are agitating the question of building a bridge over Beaver Brook, from Riverside street to Lakeview avenue, at a cost of about $27,000.

MECHANICVILLE, N. Y.—The State Railroad Commission has announced that a steel bridge must be built by the Hudson Valley Ry. to cross the tracks of the Delaware & Hudson and the Boston & Maine in place of the temporary wooden bridge near this place.

MONTEREY, MEXICO.—One of the longest railroad bridges in Mexico is being built over the Pesqueria River, near San Ysidro, on the Matamoras extension of the National of Mexico. The structure will be more than 1,500 ft. long, consisting of four spans of about 375 ft. each. The bridge will have a height of 250 ft. Messrs. Mackin & Dillon, of Monterey, have the contract for the abutment work and central piers.

NEBRASKA CITY, NEB.—Separate bids are wanted Oct. 27, by Chas. H. Busch, Otoe County Clerk, for the building of one steel bridge 90 ft. long, with 18 ft. roadway, on steel tubes 36 in. x 26 ft., at Syracuse; also for one steel bridge 90 ft. long and 18 ft. roadway, with sidewalk of 4 ft. 6 in., on steel tubes 36 in. x 32 ft., at Nebraska City, and necessary approaches.

NEWARK, N. J.—The joint committee of Hudson and Essex Counties have agreed to recommend to the county boards the building of the new bridge over the Hackensack River on the plank road. The plans and specifications which have been approved provide for a steel bridge with a roadway 40 ft. wide, with 7½ ft. sidewalks, of a total length of 1,430 ft., the paving to be either of creosoted blocks or asphalt, and to carry two trolley tracks. There is to be one draw span and eight fixed spans of 150 ft. each. The piers are, center pier, 42 ft. in diameter; raised piers, 8 ft. 6 in. thick by 59 ft. wide, and intermediate piers, 6 ft. 6 in. x 46 ft. There are to be three motors, any one of which will ordinarily be sufficient to turn the draw. (Sept. 25, p. 697.)

PHILADELPHIA, PA.—Residents are asking the City Council to appropriate $500,000 out of the proposed permanent loan to build a bridge over the Schuylkill River at Passyunk avenue. The sum of $50,000 has already been appropriated to begin the work.

PITTSBURG, PA.—An officer of the Pittsburg & Lake Erie tells us that there is nothing in the reports that the road will replace many of the present wooden bridges with stone structures, and adds that the company is only carrying out a general policy of substituting permanent structures for temporary ones when required.

SODUS, N. Y.—State surveyors are making plans for building a new bridge over Sodus Bay in the town of Huron, to be built by the State, to replace the present bridge, which has been condemned.

STERLING, ILL.—The time for filing bids has been extended to Oct. 14 for the concrete arch bridge over Rock River at this place. Fred. R. Stoddard, Town Clerk. (Sept. 18, p. 679.)

STROUDSBURG, PA.—Surveys are being made for the new bridge to be built between Stroudsburg and East Stroudsburg by the State. (July 3, p. 501.)

TERRE HAUTE, IND.—The County Council has under consideration an appropriation for 15 new bridges.

TOPEKA, KAN.—The Topeka Railway Company, it is reported, will build a temporary wooden bridge over the Kansas River, and on its completion will immediately commence the building of a steel structure to replace it, using the temporary bridge as a false work in building the new bridge.

TORONTO, ONT.—The Railway Committee of the Privy Council has ordered the construction of a bridge over the tracks of the Grand Trunk and the Canadian Pacific at the foot of Yonge street, Toronto.

VENTURA, CAL.—Plans are being made by County Surveyor Waud, for a concrete culvert and fill, over the Ellsworth Barranca east of Ventura.

VERNON, IND.—Bids are wanted Oct. 10, by W. S. Campbell, County Auditor, for building a steel bridge with stone substructure over Sandy Creek in Geneva Township.

WILLIAMSPORT, MD.—The people are agitating the question of a bridge, at a cost of about $60,000, to be built over the Potomac River between Washington County, Md., and Berkeley County, W. Va.

WILLIAMSPORT, PA.—Bids are wanted Oct. 13 by the Commissioners of Lycoming County for the building of four iron and steel bridges; two low truss bridges each 60 ft. long, with a 16-ft. roadway; one plate girder bridge 52 ft. long, with 16-ft. roadway, and one deck girder bridge 41 ft. long and 24 ft. roadway, with 5-ft. walks.

Other Structures.

ALLANDALE, ONT.—The Grand Trunk proposes to build a roundhouse and repair shops for locomotives and cars for its northern division.

BANGOR, ME.—In connection with the building of the new station at Bangor by the Maine Central, we are told that plans are not yet ready; also that no arrangements have been made for a new bridge over the Kenduskeag River at Bangor.

BRIDGEPORT, CONN.—The New York, New Haven & Hartford, it is reported, has let a contract to Horton & Hemenway Co., of Providence, R. I., for the building of its new station.

BRIDGEBURG, ONT.—A new roundhouse is about to be built by the Grand Trunk at Bridgeburg.

BUTTE, MONT.—The Business Men's Association is agitating the question of a union station at this place. A committee will confer with the various railroads looking towards a settlement of the question.

CINCINNATI, OHIO.—The plans to build a union station in Cincinnati, we are told by one of the parties interested, are under consideration but not yet drawn.

JACKSON, MISS.—The State Railroad Commission has passed an order requiring the railroads entering Jackson to appear and show cause why a new union station should not be built by them at that city.

KANSAS CITY, MO.—The long delay of the railroads in deciding what they will do towards building a union station in Kansas City, appears to have exhausted the patience of the residents, and it is said that they are now considering the advisability of petitioning the City Council to coerce the railroads into definite action.

PORT LOS ANGELES, CAL.—The Southern Pacific, it is reported, will spend about $100,000 in improving the long wharf at this place. Plans, it is said, have been completed, and work will begin at once.

SALT LAKE CITY, UTAH.—In reference to the new station to be built at Salt Lake City by the Denver & Rio Grande, an officer states that this matter largely depends on securing certain city franchises accentable to the company which may not be passed for several months.

An officer of the San Pedro, Los Angeles & Salt Lake says that the new station to be occupied jointly with the Oregon Short Line is to be built under the direction of the latter company.

TYLER, TEXAS.—The Railroad Commission will try to induce the St. Louis Southwestern to build a new station at this place.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

ALASKA CENTRAL.—Work was begun on this railroad on Sept. 1. The proposed route is from Seward, on Resurrection Bay, Alaska, north via Lake Kenai, on Caribou Pass, to Atwood, on the Tanana River, 420 miles. The Tanana Construction Company, of Chicago, have the contract for building the first 125 miles of the road. G. W. Dickinson, Tacoma, Wash., is President and General Manager. (June 26, p. 498.)

BEAUMONT, SOUR LAKE & HOUSTON (ELECTRIC).—Work has been begun on this proposed electric railroad from Beaumont to Sour Lake, 10 miles. It is stated that the line will be opened for traffic before the end of the year. (June 26, p. 478.)

BURLINGTON & SOUTHEASTERN.—This company has been incorporated in Vermont to build a railroad from Mallet's Bay, Colchester County, through Chittenden, Addison, Rutland and Windsor Counties to Windsor, 150 miles. E. C. Mower and F. O. Sinclair, Burlington, Vt., are directors.

CANADIAN PACIFIC.—President Shaughnessy has announced that a plan is now under consideration for building several local lines in western Ontario, with terminals on Georgian Bay and Lake Huron. No details of the plan have as yet been made public.

CHAMBERSBURG, ST. THOMAS & FORT LOUDON (ELECTRIC).—This company has been organized in Pennsylvania to build an electric railroad from Chambersburg west through St. Thomas to Fort Loudon, 12 miles. J. R. Eberly, St. Thomas, is President, and Frisby Miller, Secretary.

CHICAGO, MILWAUKEE & ST. PAUL.—Contract has been awarded to McIntosh Bros., Milwaukee, Wis., for building an extension from Heineman, Wis., to a connection with the Marinette, Tomahawk & Western, five miles. A portion of the latter road was recently purchased by the Chicago, Milwaukee & St. Paul. Work will be begun at once and the contract calls for its completion by Dec. 1.

CINCINNATI, NEW ORLEANS & TEXAS PACIFIC.—An officer denies the report that this company is about to build a second track from Ludlow, Ky., to Lexington. The only work that is being done at present on the main line is the building of several sidings and the lengthening of the passing tracks at a number of stations.

COAL & COKE R. R.—See Railroad News.

CONEMAUGH VALLEY.—A charter has been granted this company in Pennsylvania, with power to build a railroad 22 miles long from a point in the Borough of Franklin, Cambria County, Pa., to a point in the Borough of Ebensburg in the same county. Harvey Rowland, Ebensburg, Pa., is President.

DELAWARE, LACKAWANNA & WESTERN.—It is officially denied that this company has any intention of building a railroad between Millburn and Plainfield, N. J.

DENTS RUN R. R.—A charter has been granted this company in Pennsylvania to build from Dents Run, Cameron County, to Wilmers. C. La Rue Munson, Williamsport, Pa., is President.

DENVER & RIO GRANDE.—An officer denies the report that this company is planning to build several cut-offs on its main line between Denver and Colorado Springs.

EASTERN OF ALABAMA.—An officer writes that this company is not planning to build an extension from its present terminus at Pyrites, Clay County, Ala., to Roanoke.

EMORY RIVER R. R.—Articles of incorporation have been filed by this company in Tennessee. It is proposed to build a railroad from a point on the Chattanooga Southern, in Hamilton County, to a mine a few miles south of Chattanooga. S. B. Cooke, W. R. Crabtree, T. P. McMahon, M. N. Hope and others, of Chattanooga, Tenn., are incorporators.

GREAT FALLS & OLD DOMINION (ELECTRIC).—Bids have been asked for grading the part of this road from the Virginia end of the aqueduct bridge across the Potomac River at Washington, D. C., to Great Falls. The work of strengthening the bridge for laying a single track electric railroad over it is to be begun at once under the direction of the Commissioners of the District of Columbia.

LANCASTER & EASTERN (ELECTRIC).—Charter has been granted this company to build an electric railroad from Lancaster, Pa., through Paradise, Williamstown and Kinzer to Christiana. S. R. Slaymaker is President, and M. B. Herr Treasurer, both of Lancaster, Pa.

LARAMIE, HAHN'S PEAK & PACIFIC.—An officer writes that this line has been graded from Laramie, Wyo., to Centennial, and that rails are being laid. This part of the line will be placed in operation during the summer of 1904. Surveys are now being made between Centennial and Grand Encampment, 70 miles, and contract for this portion calls for its completion by Jan. 1, 1905. Isaac Van Horn, 7 Congress street, Boston, Mass., is President, and R. D. Stewart, Laramie, Wyo., is Chief Engineer. (May 29, p. 384.)

MEXICAN ROADS.—Application has been made to the Mexican Government for a concession to build and operate a railroad from Mazapil, in the State of Zacatecas to Camacho, 100 miles.

Concession has been granted by the Mexican Government to the Southern Sonora & Alamos to build a railroad from Navajos to Alamos, in the State of Sonora. It is stated that the necessary financial arrangements have been made for building the line.

MISSOURI, KANSAS & TEXAS.—An officer writes that this company is now relaying its main line from Muscogee, Ind. T., to Denison, with 85-lb. rails in place of the 65-lb. now in use. The report that an extension is to be built from Colmesneil, Texas, to Trinity appears to be only a rumor. (Sept. 25, p. 698.)

MISSOURI, OKLAHOMA & WESTERN.—This company has been chartered in Oklahoma to build from Vinita, Ind. T., to Denver, Colo., via Bartlesville, Ponca City, Lamont, Pond Creek and Alva. Surveys have been completed from Vinita west to Lamont, 200 miles, and grade has been established to a point 17 miles west of Ponca City. It is stated that contract for grading the remainder of the line will be let Nov. 1.

NASHVILLE, CHATTANOOGA & ST. LOUIS.—It is reported that this company will soon begin work on an extension from Lax, Ala., south to Decatur, 15 miles. Connection will be made with the Louisville & Nashville and the Southern at Decatur.

NATIONAL OF MEXICO.—It is reported that surveys are now being made for a branch line from the City of Mexico to La Blanca mines, in the Cerralvo district, 28 miles.

NORTHERN ILLINOIS ELECTRIC.—Press reports state that work will be begun at once on this electric railroad from Dixon, Ill., through Amboy, Lee Center and Steward to De Kalb, 56 miles. G. H. Shaw, Dixon, Ill., is President, and I. R. Titus, Steward, Ill., is Secretary.

NORTHERN PACIFIC.—Press reports state that the extension from Mackenzie, N. Dak., to Linton, 45 miles, is practically completed and that the line will probably be placed in operation by Nov. 1. (See Construction Supplement.)

PINE BLUFF & WESTERN.—Surveys have been completed and rights of way secured for this railroad from Sheridan to Benton, Ark., 25 miles. Contract for grading is reported let to McArthur Bros., Chicago, and it is said that work will be begun at once. W. P. Radford, Pine Bluff, Ark., is Chief Engineer. (Sept. 4, p. 642.)

ST. LOUIS & VALLEY PARK.—A charter has been granted this company to build from St. Louis to Valley Park, Mo., 15 miles. W. H. Langdale, H. S. Doyle, J. E. Bishop and T. H. Cobbs, Jefferson City, Mo., are incorporators.

ST. LOUIS, IRON MOUNTAIN & SOUTHERN.—Press reports state that the White River branch has been completed from Mount Olive, Ark., west to Cotter, 51 miles, and that the line will soon be open for traffic.

SALEM & EASTERN.—This company has been incorporated in Ohio to build from Sebring, in Mahoning County, southeast through Salem and Leetonia to East Palestine, 25 miles, with a spur from Salem to Lisbon, 10 miles. Connection will be made with the Pittsburg, Lisbon & Western at Lisbon. Names of incorporators are not stated.

SAN FRANCISCO & SOUTHERN.—This company has been incorporated in California to build from Santa Cruz northwest through Pescadero and Half Moon Bay to San Francisco, 60 miles. L. F. Young, L. E. Prescott and G. H. Foulks, of San Francisco, are incorporators.

SIOUX CITY & LE MARS INTERURBAN.—This company has been organized in Iowa to build an electric railroad from Sioux City northeast to Le Mars, 30 miles. The new line will parallel the Illinois Central and the Chicago, St. Paul, Minneapolis & Omaha between these two points. G. E. Ward is President, A. M. Jackson, Secretary, and W. S. Gilman, Treasurer, all of Sioux City.

SOUTH & WESTERN.—An officer says that work will be begun at once on an extension from Johnson City, Tenn., north to St. Paul, Va., 90 miles, and from Spruce Pine, N. C., to some point on the Atlantic coast not yet determined. (Aug. 28, p. 624.)

SOUTHERN ILLINOIS ELECTRIC.—Press reports state that work will shortly be begun on this proposed electric railroad from Mt. Vernon, Ill., through Boyd, Irvington, Okawville, New Memphis and Mascoutah to Belleville, Ill. J. R. Piercy, Mt. Vernon, Ill., is President. (July 17, p. 534.)

VALLEJO, BENICIA & NAPA VALLEY.—Press reports state that contracts are about to be let for building this proposed railroad in California. J. W. Hartzell, Oakland, Cal., is to be in charge of the work.

VARNER, CUMMINGS & EASTERN.—This company is about to build an extension from Varner, Ark., to Pine Bluff, 25 miles. At a recent meeting of the stockholders the capital stock was increased to $700,000 to pay for the extension.

WARREN & CORSICANA PACIFIC.—This road which extends from Warren, Texas, to Campwood, 18½ miles, has been changed from narrow to standard gage. J. R. Campbell, Houston, Texas, is President.

WISCONSIN CENTRAL.—The newspapers say that this company will shortly begin work on a cut-off from Spencer, Wis., northwest to Boyd, 40 miles. The new line will be about 10 miles shorter than the present line.

GENERAL RAILROAD NEWS.

ANN ARBOR.—Gross earnings of this company for the year ending 1903 were $2,037,215, an increase of $143,805. Operating expenses were $1,324,052, an increase of $101,430, leaving an increase in net earnings of $76,274. The average rate per ton-mile increased slightly, while the revenue tons per train-mile increased from 280 to 292, and the average revenue per train mile increased from $1.91 to $2.02. The trans-lake service of the company produced 42.5 per cent. of the total freight earnings for the year. In order to keep this traffic up to the present standard, a new freight-car boat, with a capacity of 30 cars, has been ordered. Trackage rights have been leased to the Wabash, between Milan and Toledo, at a fixed rental of $20,000 per year.

BALTIMORE & OHIO.—This company has taken over the White Creek R. R., which runs from Unamis into Somerset County, Pa., for a distance of 20 miles. The road connects with several large mines in Somerset County and has been operated up to this time by the Droney Lumber Company.

BROCKVILLE, WESTPORT & SAULT STE. MARIE.—The action of the creditors to set aside the sale of this road to a New York syndicate which bid in the property at foreclosure sale in January, 1903, has been dismissed. The road will now be reorganized under the name of the Brockville, Westport & Northwestern. The line runs from Brockville to Westport, Ont., 45 miles, and connects with the Canadian Pacific, and the Grand Trunk; and with the New York Central & Hudson River by means of a ferry at Brockville. (Jan. 30, p. 92.)

COAL & COKE R. R.—The *Commercial and Financial Chronicle* has the following to say with regard to the consolidation of the Coal & Coke R. R. and the Charleston, Clendennin & Sutton: At the annual meetings of the respective companies on Aug. 11, 1903, the necessary action was taken for the sale by the Charleston, Clendennin & Sutton R. R. Co. of its railroad and all its property to the Coal & Coke Ry. Co. The latter company took over the property and began the operation of the road on the 1st of September, 1903, as its Charleston Division. The Coal & Coke Ry. Co. is engaged in establishing a line from the neighborhood of Elkins, W. Va., to Charleston, W. Va., 175 miles. Of this it has in operation as its Charleston Division 64 miles from Charleston to Otter, and is building from Otter to the neighborhood of Elkins, 110 miles. Some 15 miles of the road from the upper, or Elkins end, has been completed and track laid. The remainder is under construction, partly by the company's men and partly by contractors. It is expected the whole line will be completed in the spring of 1905. The railway company owns about 50,000 acres of coal lands on the line of the road. H. G. Davis, President, Elkins, W. Va.

ERIE.—The report of this company for the fiscal year ending June 30 shows gross earnings of $45,830,413, an increase of $4,935,979. Operating expenses were $29,925,758, an increase of $1,998,659, leaving an increase in net earnings of $2,937,319. Of the gross earnings, general freight traffic showed an increase of 16.77 per cent., and bituminous coal 30.41 per cent.; but the receipts on account of anthracite coal decreased 1.59 per cent. by reason of the strike, which lasted during four months of the fiscal year. Passenger earnings increased $382,390, or 5 per cent. The ratio of expenses to earnings for the year was 65.30 per cent. as compared with 68.29 per cent. in 1902. The heaviest increase in operating expenses was in the cost of conducting transportation which showed an advance of $1,723,183, due to increased wages and higher cost of fuel.

GAINESVILLE, JEFFERSON & SOUTHERN.—It is reported that this railroad, which runs from Gainesville, Ga., to Social Circle, 52 miles, with a branch from Belmont to Jefferson, 13 miles, will be sold at foreclosure sale on Dec. 15.

GRAND RAPIDS, KALKASKA & SOUTHEASTERN.—See Pere Marquette below.

GREAT NORTHERN.—The annual report of this company for the fiscal year ending June 30 shows gross earnings of $40,785,646, an increase of $4,753,390. Operating expenses were $20,076,828, or an increase of $2,287,664, leaving net earnings of $20,708,818, an increase of $2,465,727. The sum of $3,000,000 was appropriated out of earnings for improvements and renewals, and dividends amounting to $8,673,973 were paid; leaving a net balance of $4,134,635, which was transferred to profit and loss. Ton mileage of revenue freight increased 13 per cent., and earnings from freight traffic increased 12.8 per cent.

NEW YORK CENTRAL & HUDSON RIVER.—The gross earnings of this company for the fiscal year ending June 30 were $77,605,778, an increase of $6,701,910. Operating expenses were $53,459,314, an increase of $6,595,825, leaving an increase in net earnings of $106,085. The large increase in operating expenses was due to heavy expenditures for maintenance of way and maintenance of equipment, and an increase of $3,111,000 in the cost of conducting transportation. Only $55,913 was added to the profit and loss account as compared with $4,064,674 the year before. In 1902 this account was swelled by premiums on new stock sold. The total profit and loss surplus is now $15,890,580.

NORFOLK & WESTERN.—This company has announced that the Clinch Valley Division has been re-opened for traffic. The line has been closed for several weeks owing to a severe fire in the Craigen tunnel. (Oct. 2, p. 714.)

PERE MARQUETTE.—The company has bought the Grand Rapids, Kalkaska & Southeastern, which runs from Rapid City, Mich., to Stratford, 40 miles. This road has been operated by the Pere Marquette under a lease since 1898.

PERRY COUNTY.—This railroad, running from Duncannon, Pa., to Landisburg, 23 miles, which was recently sold at foreclosure sale, is to be reorganized under the name of the Susquehanna River & Western. (Sept. 18, p. 680.)

READING.—The annual report for the fiscal year ending June 30, which includes the statements of the Reading Company, the Philadelphia & Reading Railway and the Reading Coal & Iron Company, shows gross earnings of $62,142,723, an increase of $1,136,249. Operating expenses were $42,815,462, a decrease of $1,977,388, leaving an increase in net earnings of $3,113,637. The surplus of the three companies for the year shows an increase of $2,818,956.

ST. LOUIS SOUTHWESTERN.—The annual report of this company for the fiscal year ending June 30, 1903, shows a decrease in net earnings, due chiefly to the higher cost of fuel and labor, and to the unusually heavy expenses incurred on account of the severe floods of the past season. Gross earnings were $7,278,575, an increase of $11,315. Operating expenses increased $83,097, leaving a decrease in net earnings of $71,782. The funded debt was increased during the year by $812,000.

WESTERN PACIFIC.—Press reports state that this company has filed a petition with the harbor commission of San Francisco asking for terminal facilities in the union ferry house at the foot of Market street. The petition states that the company intends to build railroad lines connecting San Jose, Stockton, Sacramento and other cities with San Francisco, as well as a line from Salt Lake to San Francisco. The railroad company expresses its willingness to advance funds, if necessary, to enable the harbor commission to make such alterations in the ferry buildings as it may deem are necessary to accommodate the new road.

WISCONSIN CENTRAL.—The gross earnings of this company for the year ending June 30, 1903, were $6,651,862. Operating expenses were $4,205,993, leaving net earnings of $2,445,869, or an increase of 13.33 per cent.